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Volume I
FIELD SERVICE POCKETBOOK

CHAPTER 8
DEFENSE AGAINST CHEMICAL ATTACK

BASIC FIELD MANUAL, VOLUME I

FIELD SERVICE POCKET BOOK

CHAPTER 8

DEFENSE AGAINST CHEMICAL ATTACK

CHANGES }
No. 1 }

WAR DEPARTMENT,
WASHINGTON, October 16, 1935.

Basic Field Manual, Volume I, Field Service Pocket Book, Chapter 8, Defense Against Chemical Attack, December 3, 1931, is changed as follows:

36. Gas-mask drill.

* * * * *

b. Commands.

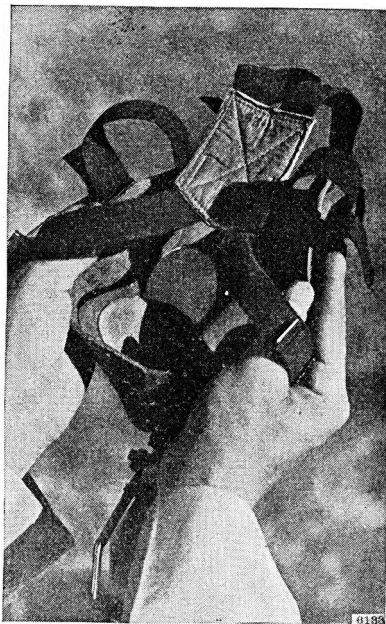
* * * * *

(2) *To adjust the mask.* ~~(a) *Dismounted.*~~ The headpiece
* * *. Bring facepiece smartly out of carrier to height of
chin, holding it firmly in both hands with the fingers of each
extended and joined outside of the facepiece, the thumbs inside,
under the lower strap of the head harness. (Fig. 5 ②a.)
* * *. Take the position of "Trail arms." (Fig. 6.)

* * * * *

[A. G. 062.11 (10-24-32).]

The following figure is added to Figure 5 ②:



② a. Position at the command *Two*. Detail of hands and mask.

FIGURE 5.

[A. G. 062.11 (10-24-32).]

The following figure is substituted for Figure 11 ④:



④ Inspecting the outlet valve and guard at the command *Four*.

FIGURE 11.

[A. G. 062.11 (10-24-32).]

37. Care of the mask.—a. Responsibility.—The gas mask is an expensive item of equipment. Its care both as an item for training purposes and as an article for the protection of the individual in war is very important. Extreme care will be exercised by commanding officers to insure that its useful life is extended as much as possible. The primary responsibility for the care of the mask rests with the individual to whom it is issued; however, the unit gas officer acting for the commanding officer is responsible for the general supervision of the care exercised in the use, storage, and repair of all masks within the unit.

b. Causes of deterioration.—The chief causes of deterioration of the mask are age, prolonged dampness, heat, improper storage, rough usage, and neglect of minor repairs. The rubber parts of the mask gradually deteriorate with age through oxidation. Oxidation is much more rapid in the presence of moisture and heat. Prolonged exposure to moisture also causes the rotting of the stockinette fabric, the loosening of binding tape, the rusting of exposed metal parts, and sometimes mildew of the safety glass eyepieces. Improper storage frequently causes the collapse of the corrugated hose and a permanent set in the facepiece which destroys the fit. Rough usage may cause a break in the canister, a puncture of the corrugated hose or facepiece, or the breaking of the head harness and head harness attachments. The life of the mask can be greatly extended by careful use, by proper storage, and by frequent inspection and repair.

c. Inspection.—The inspection specified in gas-mask drill (see par. 36b (7) and (8)) is primarily to instruct the individual in testing the mechanical functioning and state of repair of the mask. This inspection does not in any way relieve the company commander of his responsibility for the care and preservation of company equipment, nor will it relieve the unit gas officer of his responsibility to the commanding officer for the general supervision of all protective equipment. Inasmuch as a short period of improper storage may completely ruin the mask or a single defect render it ineffective, its care and preservation require frequent inspections by the unit gas officer. These inspections will include conditions of storage, care exercised in field and training use, and state of repair.

d. Repair.—Minor repairs found necessary may be made either in the field or in garrison. Gas mask repair kits are issued which contain materials, implements, and instructions for such repairs. The repair kit MII is intended for repairs of torn facepieces while the repair kit MIII contains all the materials and tools necessary for making any repairs that are possible outside a gas-mask factory. A complete description of these kits and instructions for repair of gas masks are contained in TR 1120-35.

e. Disinfection.—Whenever masks are exchanged or used by more than one individual for training purposes or otherwise, they should be disinfected immediately after use. The disinfection should be carried out as follows:

(1) *Materials required.*—A two percent solution of cresol or lysol. A supply of small rags.

(2) *Directions.*—(a) Hold the mask in the hand, saturate a small piece of rag with the disinfectant, and sponge the entire inner surface of the facepiece, including the outer and inner side of the deflector. (In this operation the facepiece should not be turned inside out.) Then apply the disinfectant similarly to the outside of the outlet valve.

(b) Pour about a teaspoonful of the disinfectant into the exit passage of the angle tube. Press the sides of the outlet valve with the thumb and finger so as to let the disinfectant run out. Do not shake off the excess.

(c) Allow all disinfected parts to remain moist for about 15 minutes and then wipe out the inside of the facepiece with a dry rag. The mask should dry thoroughly in the air before it is returned to the carrier.

f. Care in training.—The gas mask is sufficiently rugged in construction to withstand ordinary field usage. However, its life can be considerably shortened by improper care and use, and by the use of the carrier, with the gas mask in it, for purposes other than those intended. Proper care in training requires the observance of the following rules:

(1) Keep the head harness just as loose as possible without losing the fit (the tendency is to keep it too tight, thus breaking the elastic or tearing off buckles and tabs). *Keep the harness extremely loose in the first drills for recruits.*

(2) Do not permit undue stretching of the head harness in putting on the mask. Require trainees to hold firmly to the facepiece until the face is well into the mask.

(3) Do not unnecessarily throw the mask around, or use the carrier as a seat or pillow, or as a receptacle for anything except components of the gas mask.

(4) Dry out the mask and carrier immediately after using and before repacking.

(5) Make repairs promptly when they become necessary.

g. Storage.—(1) The following rules should be observed in the storage of the mask:

(a) Store the mask in a cool dry place.

(b) Do not store in sunlight or adjacent to steam radiators, stoves, or furnaces.

(c) Do not place in storage when either the mask or carrier is wet or damp.

(d) When the facepiece is in the carrier, keep the hose tube well rounded in the bottom of the carrier, thus preventing pressure on the tube by the flutter valve guard and subsequent collapse of the tube.

(e) Keep the face form in the facepiece or in the absence of a face form stuff the facepiece with newspapers. This prevents creasing of facepiece.

(f) Keep the mask where it will not be damaged by a blow or heavy weight.

(g) If the rubber in the facepiece becomes sticky in hot weather sprinkle with talcum powder.

(h) If adhesive tape becomes loose replace promptly before rust begins on binding wire.

(i) Repaint the canister whenever necessary to prevent rusting.

(2) Gas masks issued to organizations in garrison should be placed in storage racks. These racks, constructed as shown in figures 14, 15, and 16, hold the masks in such manner that collapse of the corrugated hose or creasing of the facepiece is impossible. They also permit proper ventilation and afford protection against dust and light, thus retarding the general deterioration of rubber and fabric.

[A. G. 475.92 (3-20-35).]

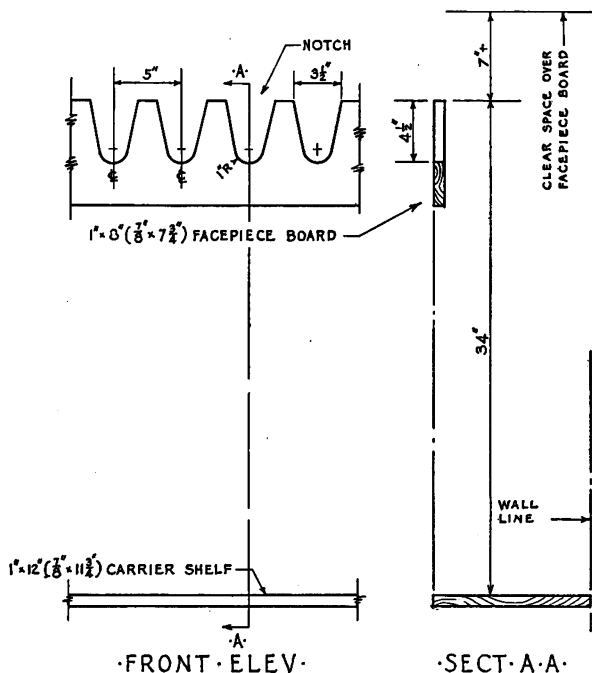


FIGURE 15.—Gas mask storage rack for diaphragm masks.

NOTE.—Supports not shown for facepiece board and carrier shelf.
 All edges of facepiece board to have $\frac{1}{8}''$ R. Chamfer $1''$ bit to be used with care.
 All lumber to be well seasoned and to be finished on all surfaces.
 Rack to be finished with 2 coats paint.

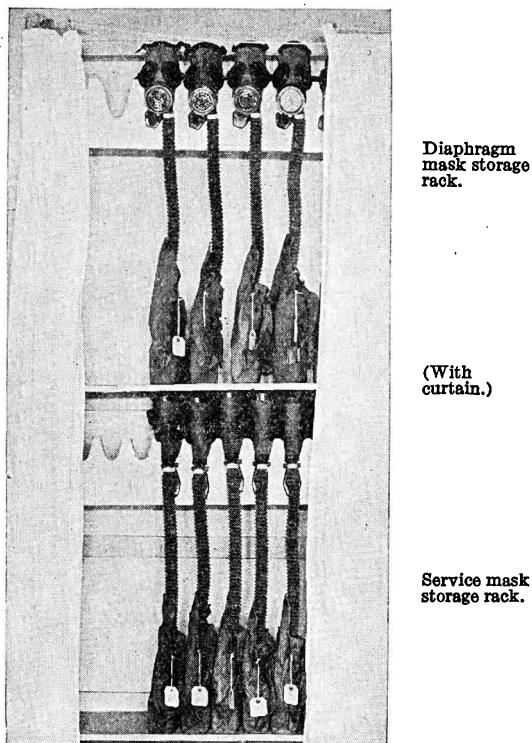


FIGURE 16.—Use of gas mask storage racks.
(For construction details, see figs. 14 and 15.)

[A. G. 475.92 (3-20-35).]

BY ORDER OF THE SECRETARY OF WAR:

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BASIC FIELD MANUAL



Volume I FIELD SERVICE POCKETBOOK

CHAPTER 8 DEFENSE AGAINST CHEMICAL ATTACK

**PREPARED UNDER THE DIRECTION OF THE
CHIEF OF THE CHEMICAL
WARFARE SERVICE**

1931



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WASHINGTON, December 8, 1931.

Chapter 8, Defense Against Chemical Attack, Basic Field Manual, Volume I, Field Service Pocketbook, is published for the information and guidance of all concerned.

[A. G. 062.11 (5-5-31).]

BY ORDER OF THE SECRETARY OF WAR:

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The Adjutant General.

BASIC FIELD MANUAL, VOLUME I

FIELD SERVICE POCKETBOOK

CHAPTER 8

DEFENSE AGAINST CHEMICAL ATTACK

(The matter contained herein supersedes Sections I, II, III, and V, TR 155-5, July 15, 1926 (including G1, January 2, 1929, and G2, January 2, 1930).)

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SECTION I

GENERAL

1. Object.—The object of instruction in defense against chemical attack is two-fold:

a. To insure the noninterruption of normal activities and employment of the arms and services during combat.

b. To minimize casualties from enemy chemical attacks.

2. Scope.—This chapter describes the types of chemical agents that may be encountered in the field, their properties, effects and first aid; the effects of weather and terrain on the use of chemical agents; how these chemical agents are projected; the items of matériel issued for chemical defense and their care and use; the training and standard of proficiency in defense against chemical attack. It also sets forth the organization and duties of individuals for defense against chemical attack. For a description of procedure before, during, and after gas

attacks, see Section IV, TR 155-5, or Chapter 6, Basic Field Manual, Volume VIII, when published.

3. Necessity for training.—To reduce gas casualties to a minimum, a high degree of training in defense against chemical attack is necessary. This training includes a general knowledge of the types of chemical agents, their properties and effects; an ability to recognize the presence of any one of these agents in the field; a general knowledge of the methods of projecting the various chemical agents; practice in the use and care of all protective apparatus; and a knowledge of the precautions to be taken before, during, and after an enemy chemical attack.

4. How chemical agents differ from other weapons.—The action of chemical agents is distributed as regards space and time to a greater extent than that of any other weapon used in the field.

a. Space.—When an HE shell or bomb bursts, there is no danger after the last fragment strikes the ground, while with a chemical shell the action only commences with the bursting of the shell. The chemical cloud drifts down wind and may produce casualties not only where the shell bursts, but at distances where there would be no danger from an HE shell. By penetrating into dugouts and underground shelters, chemical agents can achieve results which would not be obtained from an ordinary shell.

b. Time.—In the case of persistent chemical agents, the area around the point of burst of the shell will be contaminated and will remain dangerous for periods which may sometimes extend to weeks. Chemical agents cause casualties in a different way from other weapons because in many cases there is a delayed effect and the man who subsequently becomes a casualty may, at the moment he is gassed, be quite unaware of the fact. The degree of disability caused by a chemical agent depends upon the concentration to which a person is exposed multiplied by the time of exposure. The larger the product of these two factors the more serious will be the casualty. It is important that this delayed action should be thoroughly understood by all ranks, in order that its effects may not be regarded as mysterious.

SECTION II

CHEMICAL AGENTS

5. Definitions.—*a.* A *chemical agent* is a substance useful for military purposes which produces by direct chemical action a powerful physiological effect, a screening smoke, or an incendiary action.

b. A *toxic* is any substance which, acting directly through its chemical properties and by its ordinary action, is capable of destroying life or seriously endangering health when applied to the body externally, when breathed, or when taken in moderate doses internally.

c. A *lethal chemical agent* is a toxic (poisonous) material of such physical properties that a killing concentration can be set up under conditions encountered in the field.

d. A *nonlethal chemical agent* is a toxic material which exerts a profound irritating action at a concentration far below that required to produce death or seriously endanger health.

6. Classification.—The several chemical agents fall under different classifications, based upon their—

a. Physical state.—This classification is based upon the physical condition at ordinary temperatures likely to be encountered under field conditions. Thus the agent may exist as a gas, liquid or solid.

b. Physiological action.—This action of chemical agents tends to be specific in the sense that it is limited to particular parts of the body. As a result, chemical agents are grouped into classes according to their physiological effect on the human organism.

(1) *Lung irritants.*—This class of agents, as the name implies, attacks the respiratory tract and lungs. The symptoms of lung irritants may be summed up as follows:

(*a*) Catching the breath, choking, and coughing immediately upon exposure to gas.

(*b*) Inability to expand the chest in a full breath after removal from the poisoned air.

(*c*) Vomiting, hurried shallow respiration or breathing; sometimes coughing with an abundant expectoration; pain is felt behind the sternum or breastbone and the lower part of the chest.

(d) The patient gets blue in the face, and later in severe cases may go on to the gray condition which is very serious. With both of these conditions, there will be an interference with the circulation of blood.

(2) *Sternutators* (sneezing agents).—Even in very low concentrations these agents cause sneezing, vomiting, general disability and irritation of the nose and throat. They, however, produce no material effect on the lungs.

(3) *Lacrimators* (tear-producing agents).—Extremely low concentrations exert an intense irritant action on the eyes, and cause so profuse a flow of tears and so much discomfort that vision becomes impossible.

(4) *Vesicants* (blistering agents).—These cause inflammation and blistering of the skin, associated with acute inflammation of the eyes and intense inflammation of the respiratory passages.

(5) *Incendiaries*.—Burns received from these substances are ordinary heat burns, but they may be very severe. White phosphorus may be scattered on the body or even driven into the flesh by explosion of this substance, and continue to burn after becoming imbedded in the flesh.

c. *Tactical use*.—Chemical agents are classified by the tactical purpose for which they are used.

(1) *Casualty agents*.—These agents have characteristics which adapt them primarily to the infliction of casualties.

(2) *Harassing agents*.—These agents tend to reduce the efficiency of troops by compelling them to wear gas masks with consequent reduction of their mobility and power of endurance.

(3) *Screening agents*.—These agents form smoke and interfere with observation.

(4) *Incendiary or destructive agents*.—These agents are capable of setting fire to or contaminating material and supplies.

d. *Persistency*.—Chemical agents are classified as persistent or nonpersistent; those remaining effective over ten minutes are persistent; those effective for less than 10 minutes are nonpersistent.

7. *Table of agents*.—The following table gives in a brief form the practical information on chemical agents needed in the application of defensive measures against chemical attack.

LUNG IRRITANTS

Common name.....	<i>Chlorine</i>	<i>Phosgene</i>	<i>Diphosgene</i>
C. W. S. symbol.....	Cl.....	CG.....	DP.....
Persistence.....	Nonpersistent.....	Nonpersistent.....	Persistent.....
Summer.....	5 to 10 minutes.....	5 to 10 minutes in open, 30 minutes in woods.....	30 minutes.....
Winter.....	10 minutes.....	10 minutes in open, 1 hour in woods.....	2 hours.....
Physiological classification and action.....	Lung irritant; coughing, smarting of eyes, feeling of discomfort in chest.	Lung irritant; very much more toxic than chlorine; affects lower part of lungs. Does not take effect at once. The effect is cumulative and exposure to low concentrations over an extended period of time is very dangerous.	It has about the same effect as phosgene and in addition causes tears or lacrimation.
First aid.....	Remove patient from gassed area; keep quiet and warm; prevent all exertion;	Musty hay or green corn.....	give coffee as stimulant if available.
Odor in air.....	Disagreeable; pungent.....	Casualty agent.....	Peculiar, irritating and suffocating; like ensilage; sharp and acrid; stings eyes.
Tactical classification.....	Casualty agent.....	In shell or cylinder under pressure is colorless liquid; when released under normal atmospheric conditions forms into a colorless gas.	Casualty agent.
Color and state.....	In cylinder or shell under pressure is yellow liquid; when released under normal atmospheric conditions turns into heavy greenish-yellow gas.	In cloud gas attacks from cylinders, Liveness projector shell and mortar shells. In large caliber artillery shell and aviation bombs.	In a shell under pressure is a liquid; when released under normal atmospheric conditions is a colorless gas.
How used.....	Suitable for cloud gas attacks. Mixed with phosgene and chlorine in cylinders and Liveness projector shell.	Army gas mask.....	The Germans used this agent in artillery and mortar shell.
Protection required.....	Army gas mask.....		Army gas mask.

VESICANTS (BLISTERING AGENTS)

Common name.....	Mustard gas.....	Lewisite.....
C. W. S. symbol.....	HS.....	ML.....
Persistence.....	Persistent.....	Persistent.....
Summer.....	1 day in open; 1 week in woods.....	1 day in open; 1 week in woods.....
Winter.....	Nearly all winter.....	Very persistent; less than HS.
Physiological classification and action.....	Classified as a vesicant; however, on unprotected personnel it is a very powerful lung irritant agent, exceeding even phosgene in this action. Mustard acts without the warning effect of pain or irritation. It is cumulative, and exposure to low concentrations over long periods of time is very dangerous. Mustard causes injury to any part of the body with which it comes in contact, and like all lung irritant agents, its earliest symptoms are often burning of the eyes associated with profuse lacrimation. The skin burns produced by this agent are slow in developing so that an individual may be subjected to a deadly concentration on and not realize the serious nature of his injury for several hours. Remove patient from gassed area. Remove contaminated clothing. Prompt removal of mustard from skin by washing with water. If available, wash with soap and water or sponge with rags soaked in gasoline or lubricating oils. Solution of chloride of lime (bleaching powder) may also be used. Wash eyes with water; do not bandage or rub.	The effects are similar to those of mustard. In flames all parts of body with which it comes in contact. It contains arsenic and in addition to its blistering action this arsenic is absorbed by the skin and may produce a form of arsenical poisoning. The symptoms appear almost immediately.
First aid.....	Remove patient from gassed area. Remove contaminated clothing. Prompt removal of mustard from skin by washing with water. If available, wash with soap and water or sponge with rags soaked in gasoline or lubricating oils. Solution of chloride of lime (bleaching powder) may also be used. Wash eyes with water; do not bandage or rub. Like garlic or horseradish. Casualty agent. Both in the shell and when released under normal atmospheric conditions it is a heavy, dark, oily liquid. Artillery shell and aviation bombs. Can be sprayed from airplanes or from containers carried by tanks or other vehicles. Containers filled with HS can be placed in position and fired statically. Army gas mask and protective clothing. Chloride of lime applied to the area. Cover with earth.....	Small areas, quickly cut away the flesh contaminated; large areas, wash with oils, hot water and soap if available, then dry. Like geraniums, then biting. Casualty agent. Under normal atmospheric conditions is a dark-green, oily liquid. Airplane spray, airplane bombs and artillery shell.
Odor in air.....	Like garlic or horseradish.....	Like geraniums, then biting.
Tactical classification.....	Casualty agent.....	Casualty agent.
Color and state.....	Both in the shell and when released under normal atmospheric conditions it is a heavy, dark, oily liquid.	Under normal atmospheric conditions is a dark-green, oily liquid.
How used.....	Artillery shell and aviation bombs. Can be sprayed from airplanes or from containers carried by tanks or other vehicles. Containers filled with HS can be placed in position and fired statically.	Airplane spray, airplane bombs and artillery shell.
Protection required.....	Army gas mask and protective clothing.	Army gas mask and protective clothing.
Field methods of destroying.....	Chloride of lime applied to the area. Cover with earth.....	Cover with earth or spray with water.

LACRIMATORS (TEAR-PRODUCING AGENTS)

Common name..... C. W. S. symbol..... Persistence..... Physiological classification and action..... First aid..... Odor in air..... Tactical classification..... Color and state..... How used..... Protection required.....	<i>Chloracetophenone</i> (tear gas) CN..... Solid persistent for days; burning mixture for 10 minutes. Lacrimator; it produces a flow of tears, but its effects are only temporary. Remove patient to pure atmosphere; have patient kept quiet and warm. Like apple blossoms..... Harassing agent..... Brown crystalline solid..... May be used in the solid form in burning type of munition, such as candles or grenades where it is dispersed as a cloud of small solid particles. As a solution in grenades, artillery shell, chemical mortar shell, airplane spray and bombs. Army gas mask.....	<i>Chlorpicrin</i> (vomiting gas) PS..... Persistent; 6 hours in the open; 12 hours in woods. It is a lung irritant but also causes lacrimation and vomiting. It is not as toxic as phosgene. Sweetish, like fly paper, and somewhat resembles anise. Harassing agent..... In shell under pressure it is a yellow, oily liquid. On explosion of shell most of liquid turns into a vapor or colorless gas. Is mixed with CN in 75-mm. shells, air bombs, chemical mortar shell, grenades and airplane spray. Mixed with phosgene in Livens projector shells. Army gas mask.....	<i>Brombenzylcyanide</i> (tear gas). CA..... A persistent agent remaining for several days. Lacrimator. In case of chlorpicrin, Do not rub or bandage eyes. Like sour fruit. Harassing agent. Under normal atmospheric conditions it is a dark brown, oily liquid. In artillery shell. Army gas mask.
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STERNUTATORS (SNEEZE GASES)

Common name.....	<i>Adamsite</i> (irritant smoke)	<i>Sneeze gas</i> (irritant smoke).
C. W. S. symbol.....	D.M.	D.A.
Persistence.....	Nonpersistent; 10 minutes in open from candle.	Nonpersistent; 5 minutes.
Physiological classification and action.....	Produces a burning sensation in the nose and throat, accompanied by sneezing, nausea, vomiting, and extreme depression.	Produces lachrimation, sneezing and disability; strong concentrations are unbearable.
First aid.....	Remove patient to pure atmosphere; keep quiet.	
Odor in air.....	Odor like coal smoke.	Like shoe polish.
Tactical classification.....	Harassing agent.	Harassing agent.
Color and state.....	A yellowish-green granular solid; a yellow smoke cloud.	In shell a black, viscous mass. A grey smoke is formed when shell explodes.
How used.....	Toxic gas candle which gives off minutely divided solid particles which are liberated in the air thereby forming a so-called toxic smoke.	Artillery shell.
Protection required.....	Army gas mask.	Army gas mask.

The following chemicals are very toxic and have been considered as possible chemical warfare agents; however, due to technical difficulties, they are at present unsuitable for warfare. All personnel should be familiar with the characteristics of these agents. Carbon monoxide has been encountered on the battlefield in dugouts with defective ventilation, in mining and sapping work and in inclosed spaces or ravines from detonation of high-explosive shell.

Common name.....	<i>Hydrocyanic acid gas.</i>	<i>Carbon monoxide.</i>
C. W. S. symbol.....	HCN.....	CO.
Persistence.....	Nonpersistent.....	Nonpersistent.
Physiological classification and action.....	Vertigo, headache, rush of blood to head, oppression of chest, sensation of constriction at throat, dryness of throat, gasping for breath and vomiting.	Onset sudden. May be warning such as pressure and throbbing in the head, "caving in" of the knees, blurred sight, roaring in the ears, pain in the stomach, sweetish taste in the mouth or nausea.
First aid.....	Immediate removal to fresh air; artificial respiration.....	Remove patient to pure atmosphere; keep warm and at absolute rest. Apply artificial respiration if needed.
Odor in air.....	Almond extract.....	Odorless.
Color and state.....	Colorless gas.....	Colorless gas.
Protection required.....	Special gas mask equipped with white canister..... Remember the Army service canister does not protect.	Special gas mask equipped with "all purpose" canister. Remember the Army service canister does not protect.

SCREENING AGENTS

Common name..... C. W. S. symbol..... Persistence.....	<i>White phosphorus</i> WP Depends upon size of burning particle; usually about 10 minutes in open.	<i>HC mixture</i> HC Only white burning.....	<i>Titanium tetrachloride</i> FM. 10 minutes in open.
Physiological classification and action.....	Solid particles, burns flesh. A fragment striking a person is likely to ignite clothing and cause severe skin burns. Smoke harmless.	Smoke harmless.....	Smoke harmless.
First aid.....	Plunge part of body containing burning particle in water or mud to extinguish. Remove thoroughly any of the solid remaining.	None needed.....	None required.
Odor in air..... Tactical classification..... Color and state.....	Like matches..... Screening agent..... Pale yellow solid of waxy consistency; when exposed to air turns into white smoke and heat generated causes it to burst into flame.	Acrid; suffocating (smoke). Screening agent..... A gray solid mixture.....	Acrid. Screening agent. Colorless or yellowish liquid. When emitted in air forms harmless white smoke. Liquid burns skin like strong acid. Vapors and smoke irritating to throat but harmless.
How used.....	Grenades, artillery shell, chemical mortar shell. When shell or grenade is exploded, the solid phosphorus is shattered and broken into small fragments and scattered about field. They are immediately ignited and form smoke cloud.	Used as a burning type munition only in candles, grenades, and special air bombs.	Artillery shell, chemical mortars, airplane sprays, airplane bombs, and special munitions.
Protection required.....	None needed against smoke.....	None.....	None.

SECTION III

EFFECT OF WEATHER AND TERRAIN ON THE USE OF
CHEMICAL AGENTS

8. Effect of weather and terrain on chemical attacks.—a. Wind.—The effective use of chemical warfare agents is largely dependent upon weather conditions. Chemical agents are most effective in light winds; high winds will rapidly dissipate them. Nonpersistent agents are comparatively ineffective in a wind of over 12 miles per hour. Chemical agents of the persistent type are not affected to the same extent by high wind. When a chemical agent is liberated from cylinders, or a special apparatus, the direction of the wind is also important; but most other chemical weapons may be used when the wind is in any direction. When a large amount of mustard gas is used, it may be anticipated that the gas will be directed far enough back in the area attacked to prevent any of the vapor from reaching friendly troops. For this reason, troops in reserve are more likely to encounter the mustard type of agent than those of the most forward areas.

b. Temperature.—On warm, sunny days when the temperature of the earth is higher than that of the air, ascending air currents are formed which carry the gas upward and disperse it. Warm weather also reduces the persistence of liquid on the ground. Extremely cold weather, on the other hand, limits the effect of a persistent chemical agent, as it reduces its rate of evaporation. Under such conditions, substances like mustard gas may freeze in the soil.

c. Fog and rain.—Foggy and cloudy weather is favorable for the use of gas. Light rainfall has very little effect, though heavy rainfall will tend to wash gas out of the air, and in most cases slowly destroy liquid on the ground.

d. Night.—The most favorable conditions for the use of chemical agents occur at night, or in the early morning, because strong winds and ascending currents are usually absent at these times. Furthermore, at night, there is the possibility of effecting a surprise on sleeping men.

e. Ground.—The effect of ground on chemical agents may be briefly summed up as follows: Tall grass, bushes, trees, buildings, etc., retard the movement of the air and in like manner the movement of vapors of chemical agents, thereby making them more persistent. In dugouts, cellars, deep hollows, and

other inclosed spaces, gases persist longer than in the open. Most chemical warfare agents being heavier than air tend to flow into gullies and valleys, leaving the tops of hills comparatively free. The effect of chemical agents from projectiles will be diminished in marshy ground, or in a shelled area where the craters are full of water. The effectiveness of gas clouds, on the other hand, is not appreciably reduced by passage over water.

9. Favorable conditions for chemical attacks.—*a.* Situations in which the enemy may use nonpersistent agents:

(1) Between midnight and sunup when ground temperature is lower than air temperature.

(2) When wind velocities are between 3 and 12 miles per hour.

(3) When wind direction is either from the enemy or parallel to the front.

(4) On troops situated in low ground or in woods.

(5) On foggy, overcast days or when a light rain is falling.

b. Situations in which enemy may use persistent agents:

(1) Against strong points which would be very difficult for the enemy to capture by assault and which he desires to avoid.

(2) In defiles.

(3) On terrain surrounding approaches to fords and bridges and on beaches.

(4) On artillery firing positions.

(5) On distributing points, airdromes, bivouac areas, rail heads, marching troops and supply columns, especially by spraying from attack aviation.

SECTION IV

FORMS OF CHEMICAL ATTACKS

10. General.—In order better to understand the measures necessary for protection against chemical agents, a thorough knowledge of the object of chemical attacks and the methods of projecting chemical agents is necessary.

11. Objects.—Chemical attacks are made with one or more of five main objects in view:

a. To inflict casualties.

b. To harass by reducing the efficiency of troops in forcing them to mask, with subsequent reduction of their mobility,

morale, and power of endurance, and by imposing a constant need for vigilance.

c. To render certain areas dangerous to occupy.

d. To form smoke and thus interfere with enemy observation.

e. To destroy material and supplies by setting fire to them or by contamination.

12. Methods of projecting chemical agents.—Chemical agents may be discharged by many methods: From artillery shell and chemical mortar shell; from Livens projector shell; from aircraft, either in bombs or as a spray; from cylinders or gas candles in the form of a cloud; from liquids and bombs placed in position and fired statically, and from hand and rifle grenades.

13. Chemical artillery shell and chemical mortar shell attacks.—*a.* Chemical shell bombardment is a type of chemical attack which, up to the present, has been most usual. The long range of the artillery and its ability to concentrate suddenly many guns on an area render artillery shell one of the most effective means of employing chemicals. Except on targets close to friendly troops, the use of chemical shell is independent of the direction of the wind, though not of its velocity. Persistent chemical agents of the mustard-gas type are usually fired from artillery shell. Nonpersistent chemical agents of the phosgene type may be projected from larger caliber artillery.

b. Chemical shell may be expected whenever artillery is in action. Before an infantry attack, however, only nonpersistent agents are likely to be used on the area over which the attack will be made, although persistent agents may be used on other areas. The chemical content of artillery shell is small when compared by weight with other chemical containers. To produce an appreciable effect, chemical shell must therefore be used in large numbers. For this reason, an important one when ammunition supply is considered, their use in mobile warfare is somewhat restricted.

c. On account of the rapidity of fire of the chemical mortars (maximum range, 2,500 yards) and the large chemical content of the shells as compared with their total weight, the light mortar shells are ideal for putting down and maintaining heavy concentrations of nonpersistent chemical agents; for establishing and maintaining smoke screens, and for firing incendiary shell. Persistent agents can also be projected from the chemical mortar.

d. Four main types of chemical shell bombardment may be employed:

(1) A short concentrated bombardment of a small target with nonpersistent shell for the purpose of inflicting casualties by surprise.

(2) Harassing fire usually consists of a slow rate of fire of shell containing persistent chemical agents such as lacrimators or mustard gas.

(3) Bombardments with persistent chemical shell to render areas untenable and to inflict casualties upon personnel occupying them. Mustard gas is the type generally used in such bombardments.

(4) Bombardments with smoke (WP) to blanket observation, screen troop movements, and inflict casualties.

e. Ordinary chemical shell containing a liquid can often be distinguished from other shell by the peculiar intermittent whirring noise they make in flight and by their small detonation.

14. **Livens projector shell.**—By means of Livens projectors, a large amount of chemical agent can suddenly be set free and such attacks therefore constitute the severest test of training in defense against chemical attacks. The projector is a simple smooth-bore mortar, dug into the ground, and designed to fire only one shot per installation. They are usually installed in batteries of 20 to 25 and are fired simultaneously by electricity. Many batteries are usually fired at one time against one target. The maximum range is about 1,500 yards. The cloud forms a blanket of gas of considerable size which travels along with the wind and may be effective at a considerable distance from the place at which the shells burst. Indications of the installation of projectors by an enemy may be obtained from airplane photographs. It should be noted, however, that projectors can be dug in, loaded, and fired in one night. A projector attack can generally be recognized by a huge flash or a series of flashes immediately followed by a loud explosion. These shells make a peculiar whirring sound in flight and a subdued explosion when they burst. The cloud produced is of a higher concentration than can be obtained in the field by any other means.

15. **From aircraft; either in bombs or as a spray.**—The employment of chemicals by airplanes is a constant threat and

must be anticipated. Aircraft bombs contain a high proportion of chemical agent and both persistent and nonpersistent agents, as well as smoke and incendiary agents, can be projected by this means. Liquid chemicals such as mustard gas, or smoke such as FM (titanium tetrachloride) may be sprayed from tanks carried by airplanes from which it falls like rain. On account of their wide radius of action, airplanes can quickly reach any part of the front or rear areas.

16. Clouds formed from cylinders or gas candles.—Chemical cloud attacks on a large scale are limited chiefly to position warfare and depend upon a proper wind direction. A gas sentry should, therefore, be on the lookout especially when the wind blows from the enemy's lines. The characteristic features of a chemical cloud attack are its pervasiveness and duration. The chemical agent liberated will affect an area extending several miles down wind, the gas being silently carried along the surface of the ground by the wind. Chemical clouds may be liberated from cylinders or candles concealed in trenches or from vehicles carrying cylinders or special gas tanks brought into position under cover or during darkness. The discharge may be made either by day or night, but the latter is most often chosen because of the surprise element. At the moment of discharge, warning is given by the loud hissing of the gas escaping from the cylinders. The cloud is normally white from condensed water vapor, but the actual location and width of the front may be disguised by the liberation of smoke. The chemical agents used are nonpersistent, but may remain for several hours in thick woods, dugouts or shelters.

17. Liquids and bombs placed in position and fired statically.—Liquid chemical agents and bombs fired statically may be effectively employed by the enemy in withdrawals and retreats; for covering the areas around destroyed bridges, fords, roads, trails; and in front of defensive positions. Persistent gases of the mustard gas type are most effective for these purposes. Liquid chemical agents of the persistent type may also be liberated from containers carried by tanks or other vehicles for the purpose of contaminating roads and communications and so hamper the advance.

18. Hand and rifle grenades.—Small quantities of chemical agents may be filled into hand and rifle grenades. Hand grenades filled with tear or irritating chemical agents have been used to clear out dugouts and inclosed spaces. Rifle grenades

filled with WP or lacrimators may be used against strong points and machine-gun emplacements.

19. Employment of smoke in gas attacks.—Gas and smoke may be used together. In attack small quantities of harassing agents may be introduced into an ordinary smoke screen to hamper the defenders by forcing them to wear gas masks. Smoke clouds may be used to extend the flanks of a gas cloud so as to conceal the extent of the actual gas front. It may also be used to simulate gas.

SECTION V

MATÉRIEL AND ITS USE

20. Equipment and issue.—Items of equipment for defense against chemical attack are Chemical Warfare Service property and are issued to units in conformity with provisions of Tables of Basic Allowances. Some of these items are complete as issued, such as, the Army gas mask; others are component parts of appliances that must be improvised by the using units; for example, gas-proof blankets are items of issue but as such are of little value. Their principal use is in the construction of doors for gas-proof shelters.

21. The Army gas mask.—*a.* The Army gas mask is a device to protect the soldier's eyes and respiratory tract from chemical warfare agents encountered in the field. The principal parts are the facepiece, hose, and canister. When carried but not in use the gas mask is kept in a carrier slung on the left side of the body. The canister remains in the carrier when the mask is in use.

b. The principle of operation of the gas mask, which is based on air filtration, is illustrated in Figure 1. Air is drawn into the mask when the soldier inhales, the mask being so constructed that this air must first pass through a canister containing a filtration system. This system comprises both mechanical and chemical filters, the former filtering out smoke and dust, and the latter adsorbing and neutralizing toxic and irritating gases and vapors. The air, after being purified by filtration, is drawn to the soldier's face and after being inhaled and exhaled is expelled from the mask.

c. The service gas mask as issued will give full protection against lung irritants, sternutators, and lacrimators in con-

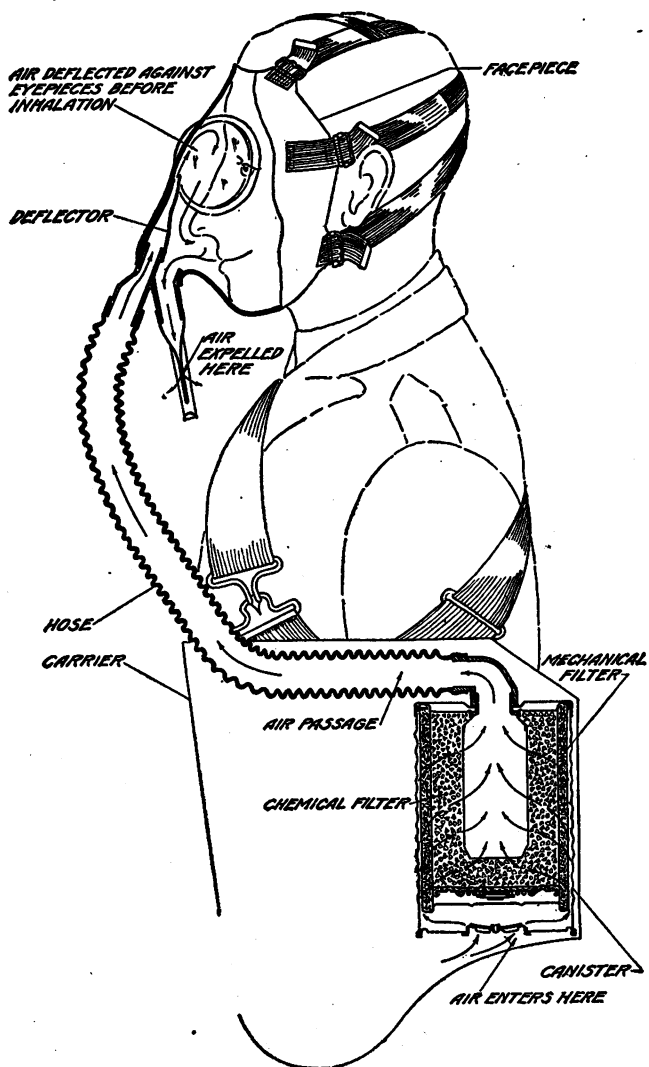


FIGURE 1.—Passage of air through the gas mask

centrations likely to be encountered in the field. It will not protect against carbon monoxide or ammonia gas, and is therefore not suitable for a fireman's mask or for use in case of industrial accident where ammonia gas is present. Antidim compound is included in the carrier which, if applied in a very thin film to both sides of the eye lenses, will assist in preventing fogging from the moisture in the mask and from rain. The diaphragm mask is issued to officers, telephone operators, and others whose duties require audible speech. (TR 1120-35.)

22. The horse mask.—The horse mask is a device to protect the respiratory tracts of horses and mules from lung irritants. This device is a bag made of cheese cloth and treated with chemicals to neutralize the gas that passes through it. Horses and mules never breathe through the mouth, hence, this bag is put over the upper jaw and nostrils only. The eyes of horses and mules are not susceptible to the action of lacrimators and therefore no protection is required. The mask when not in use is carried in a carrier secured under the horse's lower jaw.

23. Gas-proof blankets.—Gas-proof blankets are heavy woolen blankets impregnated with a chemical compound which will neutralize gas in field concentrations that passes through them. Gas-proof blankets are issued as organization equipment and are used in constructing doors and closing other openings in gas-proof shelters. In an emergency they may be used to throw over litters or other items of equipment which may have been lightly contaminated by a vesicant agent and which are needed for immediate use.

24. Gas-proof shelters.—*a. General.*—It is possible to subject extensive areas to lethal concentrations of a toxic gas for periods varying from a few minutes to several days. Masks and protective clothing are not sufficient protection against such concentrations for long duration. Troops that must remain in these gassed areas require gas-proof shelters in which to rest, eat, and sleep, as well as for dressing stations, telephone stations, observation posts, command posts, and for other activities where efficiency is unduly impaired by wearing a gas mask.

b. Location of shelters.—In locating gas-proof shelters, advantage should be taken of any natural protection from direct wind paths. Terrain has great effect upon the movement of a gas cloud, especially in a wind of low velocity. High hills and deep valleys deflect gas from the general direction of the wind. Often such protection can be secured so that there is

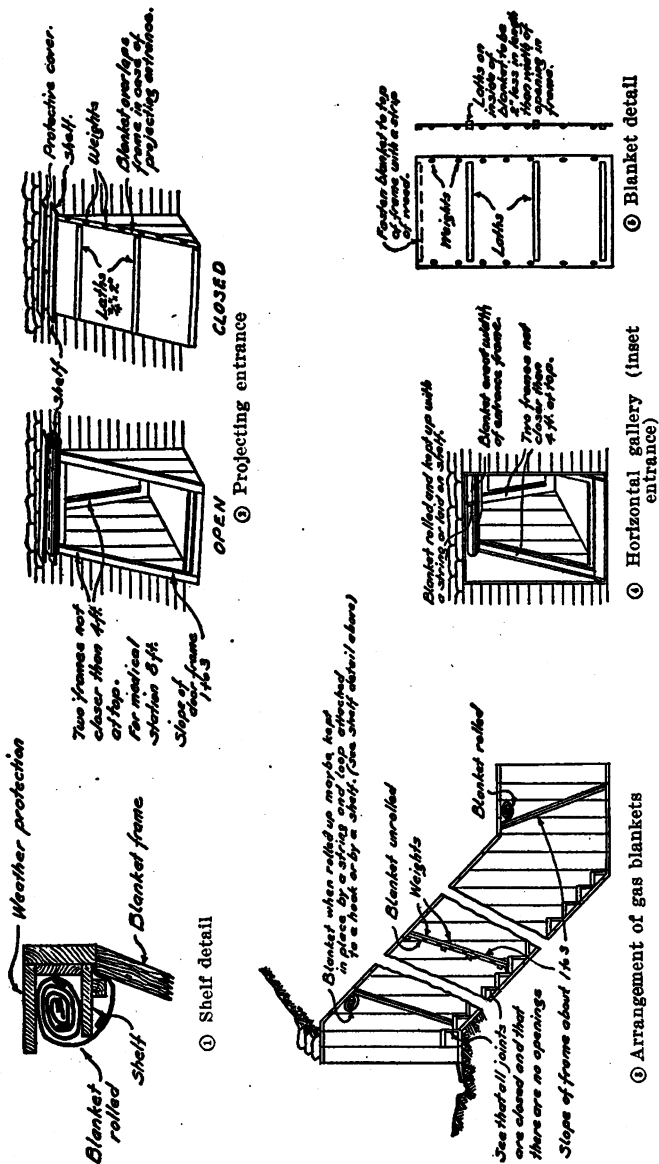


FIGURE 2.—Typical arrangement for gas-proofing dugouts

little likelihood of a heavy concentration of gas forming in the neighborhood of the shelter.

c. Principles involved.—The important consideration in making a gas-proof shelter is the elimination of all drafts. A special type of entrance is used which consists of a system of double doors of hung blankets which when dropped lie on slanting door frames. The outer door frame slants outward and the inner frame slants inward. Wherever possible the entrance to a gas-proof shelter should be a walled-in passageway or tunnel several feet beyond the walls of the shelter both inside and outside, with the ends slanted so as to receive the door frames at the proper angle. The door frame is made from 1 by 6 inch boards at the sides and 1 by 4 inch at the top and bottom. (See fig. 2.)

d. Construction of blanket doors.—Construction of blanket doors consists of cutting a blanket to the proper size (about 4 inches wider and longer than the door frame) and attaching the top end to the door frame. Slats are nailed horizontally at intervals across the inside and outside of the blanket to hold it in place when lowered and to keep it pressed against the frame. The inside slats must be about 2 inches shorter than the width of the opening of the door frame. Either nails, nuts, bolts, or other special weights are used at intervals from top to bottom close to the edges of the blanket and outside of that part of the blanket which falls on the door frames. When the blanket is lowered, the weights hang over the edge of the frame, pulling the edges of the blanket with them and thus forming a flap which keeps the blanket pressed against the frame and aids in making the door air-tight.

(1) *Shelf for door when left open.*—To open the blanket door it is rolled up and the roll is placed on a shelf above the top of the frame. If necessary, a metal cover is nailed over the shelf to protect the blanket from sun and rain.

(2) *Functioning of double-door system.*—When lowered into place, the two doors make the shelter gas-proof by forming an air lock between them. To enter the outer door, one side of the blanket on the leeward side is pulled away from the frame just far enough to permit entrance; the person then enters the air lock and closes the outer door behind him before opening the inner door. When leaving the shelter, the reverse procedure is followed.

(3) *Proper distance between gas-proof doors.*—When the entrance to the shelter is a simple horizontal passage, the doors are placed at an average distance of six to nine feet apart. If the entrance is a stairway, one door is placed at the head of the stairway and the other at the foot where there is a horizontal passageway for a few feet. If the stairway enters directly into the room, the two doors are placed at intervals on the stairway with both slanting outward. In case of a dressing room, the space between the doors must permit stretcher-bearers to bring in a stretcher without opening both doors at once.

(4) *Modifications in construction.*—Where the entrance is not a projecting passageway as described in *c* above, modifications in the construction of the blanket doors must be made. In any case the same principles should be observed.

(5) *Preparation for use.*—Lower both blanket doors, close all ventilators and put out all fires. Fires use up the oxygen, draw in air from outside and give off that odorless poison gas, carbon monoxide. See that a supply of chloride of lime is in the shelter. Spread it around between the doors at the start of a gas attack. This will neutralize any liquid agent which might adhere to the shoes of men coming from contaminated areas.

(6) *Ventilation.*—People entering during a gas attack will always bring in on their shoes and clothing traces of the toxic gas being used. This is especially dangerous in the case of mustard, as an effective concentration entirely imperceptible to the occupants may gradually be built up. In dugouts or shelters intended to be used for a considerable time collective protectors (par. 28) should be obtained from the chemical officer and installed. After a gas attack a contaminated shelter may be cleared of gas by opening the doors and building a fire within. The length of time that a gas-proof shelter may be occupied without ventilation may be estimated by applying the rule that a man requires 1 cubic foot of air per minute; more is desirable.

25. Impregnated clothing.—The regular issue Army clothing, including outer garments, underclothes, socks, and shoes, may be impregnated with neutralizing chemicals which will protect the body against mustard vapor but affords little protection against liquid mustard gas. The wearing comfort and appearance of clothing so treated is little affected. The weight of a service uniform complete is increased by approximately one pound. Impregnated clothes will stand being laundered several times without impairing the impregnate. Impregnated

clothing, when approved for issue, will be issued by the Quartermaster Corps.

26. Impermeable clothing.—For protection against liquid mustard gas, impermeable protective clothing is required. Impermeable suits, since they do not permit the passage of air or moisture, are very uncomfortable when worn for extended periods. A limited number of impermeable suits are issued to organizations. They are employed primarily by men charged with degassing areas and equipment. Impermeable clothing of this type is an article issued by the Chemical Warfare Service.

27. Gas-proof gloves and boots.—Gas-proof gloves and boots are made of impermeable material and are issued to be worn with impermeable suits.

28. The collective protector.—The collective protector is issued for use at gas-proof command posts, plotting rooms, and aid stations which are intended to be used for a considerable time and where air may, in a short time, become foul or deficient in oxygen during a gas attack. It consists of an air blower mounted on a large canister and several feet of rubber intake pipe. The collective protector should only be used in an inclosure that has been made reasonably air-tight. When an old building is being used, the windows and large cracks should be chinked with mud, rags, paper, or any suitable material available. Large openings such as shell holes can be closed with gas-proof blankets. The collective protector is set up in the room or inclosure to be protected and the intake pipe run outside. During a gas attack, the collective protector is set in operation. Air is pumped in from the outside, purified and blown into the inclosure, thus obviating the necessity of wearing the gas mask. A positive pressure of pure air is therefore built up in the protected space. Any movement of air is from the inside out and gas contaminated air will not enter. In permanent fortifications such as plotting rooms in coast defenses, the collective protectors are operated by electric motors. For mobile units the collective protectors are manually operated.

29. Degassing materials.—During active operations gas-destroying materials are issued for degassing areas, buildings, and equipment that are to be occupied or used after a gas attack; as, chloride of lime (bleaching powder) for degassing areas, etc., contaminated with mustard gas.

30. Alarm horns.—Alarm horns are issued as organization equipment. Alarm horns give a distinctive sound which is not

easily confused with other sounds encountered in action. Empty shell cases, sections of iron rail, etc., may be used as an improvised alarm when standard alarm horns are not available. There are two classes of alarms given when an enemy gas attack occurs: General alarms and local alarms. General alarms are given only in the case of cloud gas attacks of considerable magnitude which are expected to involve a large area. Local alarms are given in all other cases. A general alarm is sent out by means of all normal methods of communication, such as telephone, radio, etc., and is directed to all localities which it is predicted the gas attack will affect. Upon receipt of a general alarm, all responsible commanders take steps to give necessary instructions to the gas sentries on duty. Local alarms are usually given with the alarm horns.

31. Protective covers.—Tarpaulins, wagon and truck covers are impregnated with a neutralizing chemical in time of hostilities. Impregnated paulins are used at railheads and distributing points to protect perishable supplies such as rations, clothing, and forage from chemical attacks. Impregnated covers for vehicles are used to protect supplies in movement.

32. Protective horse boots.—Protective horse boots are issued for the protection of horses' feet and legs. This boot is made of impermeable material and is adjusted to the horse when he is required to go over ground known to be contaminated with a vesicant agent. When the protective boots are removed the legs and belly of the horse should be thoroughly washed with soap and water by personnel equipped with gas-proof gloves.

SECTION VI

TRAINING

33. Divisions.—Defense against chemical attack resolves itself into two natural divisions—individual protection and collective protection. Individual protection consists in a knowledge of the characteristics of chemical agents encountered in the field, and in the proper use by the individual of the chemical protective equipment issued to him. Collective protection comprises the additional means and measures taken by unit commanders to insure protection of their units, including supplies, equipment, and animals. These measures consist of standing gas defense orders, a system of chemical warfare intelli-

gence, a system of gas alarms, the posting of gas sentries, and, when the character of the action warrants, the construction and maintenance of gas-proof shelters. Training in defense against chemical attack is progressive. It commences with the instruction of the individual in the mechanics of individual protection, and culminates with the application of both individual and collective protection to tactical field problems of large units. See Section IV, TR 155-5, or Basic Field Manual, Volume VIII, when published, for a discussion of procedure before, during, and after gas attacks. Unit gas officers and noncommissioned officers should be rotated each training year in order that as many company officers and noncommissioned officers as practicable may receive this specialized training.

34. Phases.—*a.* Training in defense against chemical attack is divided into three phases:

(1) *First phase.*—The training of unit gas officers and noncommissioned officers.

(2) *Second phase.*—The training of the units with the assistance of the unit gas officers and noncommissioned officers in the mechanics of defense against chemical attack.

(3) *Third phase.*—The application of defense against chemical attack by including gas situations in field problems for battalions, regiments, and divisions.

b. The first phase consists of a course in defense against chemical attack in peace-time training at each post, camp, and station for instructing the unit gas officers and noncommissioned officers in their duties. This course is usually conducted by the corps area or division chemical officers and is scheduled during the indoor season. In the event of a mobilization, the unit gas officers and noncommissioned officers are assembled in the division area for the course under the division chemical officer. The object of this phase is to insure that each organization, down to and including a company, has the required number of officers and noncommissioned officers qualified to act as advisers to and instructors for their unit commanders.

c. The second phase consists of the practical training of organizations in fitting the gas mask, gas mask drill, identification of agents, masking animals, accustoming men and animals to pass through gas and smoke, marching and drilling in masks, the construction and maintenance of gas-proof shelters, and degassing of areas and equipment. In peace time the gas

masks of the division, post, or camp will, in general, be pooled for this purpose in order that as large a unit as practicable may be equipped and trained at one time. The object of this training is to familiarize troops with the protective features of the gas mask and to instruct them in its proper care, fitting, and use. This training is also designed to give both officers and men some practical experience with the effect of its use on the comfort and endurance of men, on the efficiency of giving commands, and on the control of masked individuals and units in operations.

d. The third phase consists of introducing a chemical warfare feature into normal tactical field exercises of the battalions and higher units which will require the unit gas officers to function; unit commanders to make decisions relative to defensive features; and all ranks to operate while wearing the gas mask in tear gas and smoke. Care must be taken to avoid emphasizing unduly the chemical warfare features of the exercise to the extent of making the exercises illogical or tactically unsound. In so far as practicable, situations involving defense against chemical attack will be made a part of tactical exercises which are normal to the field training of units, instead of formulating special problems for the particular purpose of illustrating defense against chemical attack. The object of this phase is to put in practice in the field what has been taught in the first and second phase as outlined in b and c above, with the intention of having all officers, men, and animals profit by actual experience with gas and smoke in the field, rather than by observing demonstrations staged by other troops.

35. Courses of instruction.—a. The following table is a guide in the preparation of instruction courses for unit gas officers and noncommissioned officers on subjects pertaining to defense against chemical attack:

Subject	Hours, drill or prac- tical	Confer- ence
General considerations.....		1
The gas mask.....		$\frac{1}{2}$
Gas-mask drill.....	4	
Characteristics and identification of agents.....	1	2
The gas chamber.....	1	
Alarm devices.....	1	1
Chemical for destroying chemical agents.....		
Protective covers.....		
Care of material.....		
Disposal of defective containers.....	1	
Gas-proof shelters.....		
Collective protector.....		
Regimental, battalion and company gas officers and noncommis- sioned officers and their duties.....		1
Army, corps and division chemical officers and their duties.....		$\frac{1}{2}$
Supply of items for defense against chemical agents.....		
Chemical warfare intelligence and effect of weather on chemical attacks.....		1
Effects of chemical agents on the human body, prevention and first- aid treatment of gas casualties.....		1
The horse mask and its adjustments.....	$\frac{1}{2}$	
Repair and maintenance of chemical warfare items of equipment.....	1	
The tactics of lethal gases (for the purpose of understanding how an enemy may employ them against friendly troops).....		2
Tactics of smoke, nontoxic gases and incendiaries.....	$\frac{1}{2}$	1
Procedure to meet a gas attack.....		1
Procedure during a gas attack.....		
Procedure after a gas attack.....		
Total (22 hours).....	10	12

b. In every course a sufficient part of the maneuvers, target practice, firing exercises, etc., should be conducted in the presence of smoke and tear gas to accustom the students to working under such conditions. At least half of the map problems should involve the use of chemical agents (gas or smoke or both) to some extent. Critiques should cover the possible or probable condition arising had toxic chemical agents of various types been used.

c. The following matériel is desirable in conducting the above course, and if available can be secured by approved requisition on the corps area chemical officer:

- 1 gas mask for each student.
- CN, 1 ounce (for charging gas chamber), or CN capsules.
- 1 gas identification set.
- 2 blankets, dugout, or model gas-proof dugout.
- 1 horse mask.
- Smoke candles within prescribed allowances.
- Tear gas candles within prescribed allowances.

1 moving picture "Defense Against Chemical Warfare."

(Can be obtained from corps area signal officer.)

1 portable chemical museum.

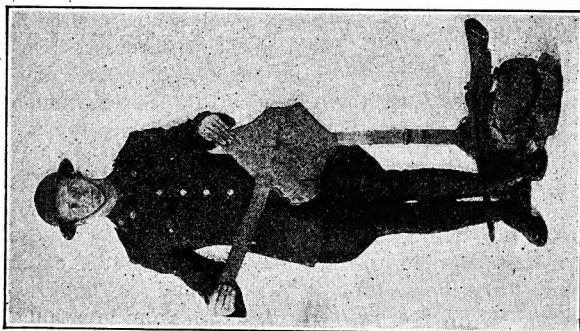
d. The following items of ordnance matériel are valuable in conducting the course:

Smoke and tear gas hand and rifle grenades.

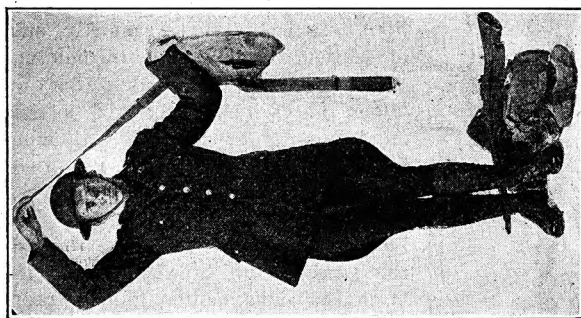
Artillery smoke shell, both 75-mm. and 155-mm.

36. Gas mask drill.—a. *General*.—Preliminary drill will be by the numbers in order to acquire thoroughly a complete and accurate adjustment of the mask, and to habituate the individual in its correct manipulation. Proficiency in this drill will be followed by practice without the numbers to insure rapidity of adjustment. Practice in holding the breath will also be included. Careful adjustment, as a rule, is more essential than great speed.

b. *Commands*.—(1) *To sling the mask*.—1. *Sling*, 2. *MASK*. At the command *Sling*, grasp with the left hand the metal hook, which is near the flap of the carrier, above the two snap fasteners, at the same time grasping with the right hand the metal clasp at the extremity of the shoulder sling. Hold the carrier waist high in front of the body with side containing snap fasteners next to the body. (Fig. 3, ①.) At the command *Mask*, extend the left arm sideways to full length. At the same time pass the shoulder sling behind the head and over the right shoulder with the right hand (fig. 3, ②), then bring the two hands together across the chest and fasten the hook and clasp together. (Fig. 3, ③.) Adjust the carrier snugly under the left arm pit. Pass the waist strap around the waist and fasten together in front. (Fig. 4.)



① Position at the command Sling



② Passing the shoulder sling behind the head and over the right shoulder at the command
Mask

FIGURE 3.—To sling the mask



③ Fastening the hook and clasp together

(2) *To adjust the mask.*—(a) *Dismounted.*—The headpiece adjusted with strap under the chin. 1. *By the numbers, 2. GAS.* Stop breathing. Place rifle (if unslung) between knees so that butt is off the ground; with left hand open flap of carrier; place fingers of left hand on chin above the chin strap; with the right hand knock off headpiece from behind (the headpiece being caught on the left arm by the chin strap), and continue the



FIGURE 4.—Mask in slung position. (The pack is put on after the mask is slung. The left front strap of pack is snapped to cartridge belt over the gas mask)

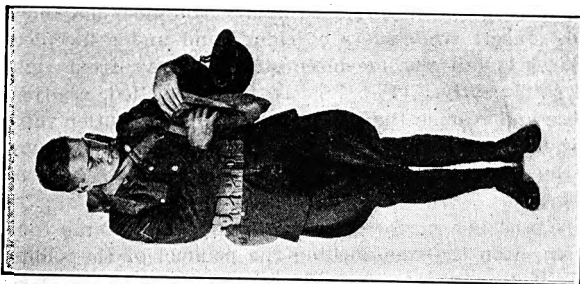
downward movement of the right hand until the latter is on a level with the opening of the carrier. Thrust the right hand into the carrier, grasping facepiece between the thumb and fingers just above the angle tube. Grasp the flap of the carrier with the left hand. (Fig. 5, ①.)

TWO. Bring facepiece smartly out of carrier to height of chin, holding it firmly in both hands with the fingers of each extended and joined outside of the facepiece, the thumbs inside, midway between the two lower straps of the head harness. Thrust out the chin. (Fig. 5, ②.)

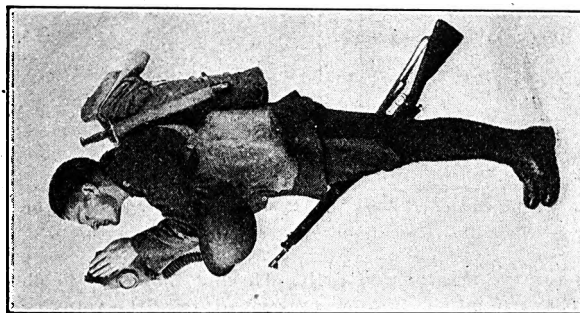
THREE. Bring the facepiece toward the face, digging the chin into it. With the same motion guide straps of the harness over the head with the thumbs. (Fig. 5, ③.) **FOUR.** Feel around the edge to make sure the facepiece is well seated. (Fig. 5, ④.) See that head harness is correctly adjusted. **FIVE.** Close outlet valve by pinching between thumb and fingers of right hand to prevent passage of air through it and blow

vigorously into the mask, completely emptying the lungs, thus clearing the facepiece of gas. (Fig. 5, ⑤.) **SIX.** Replace headpiece, adjusting the chin strap to the back of the head. Pass the flap of the carrier around the hose and fasten on the outer snap fastener. Take the position of "Trail arms." (Fig. 6.)

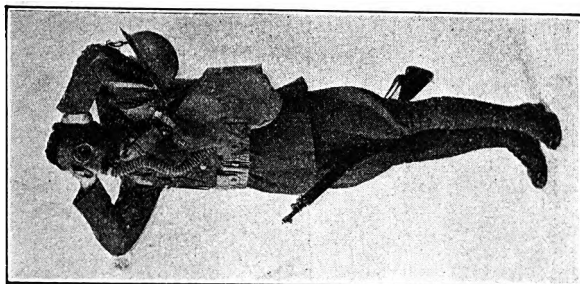
(b) *Mounted.*—1. *By the numbers, 2. GAS.* Stop breathing. Drop the reins behind the pommel of the saddle. Continue as



① Position at the command
Gas



② Position at the command *To*



③ Position at the command
Three

FIGURE 5.—To adjust the facepiece by the numbers



④ Position at the command *Four* ⑤ Position at the command *Five*
 FIGURE 5.—To adjust the facepiece by the numbers—Continued

prescribed for the dismounted drill. Having fastened the flap of the carrier around the hose as prescribed, take the reins.

(3) *To test for gas.*—Mask being adjusted, the command is: **TEST FOR GAS.** Dismount if mounted. Take a moderately full breath. Stoop down so as to bring the face close to the ground but do not kneel, care being taken that the rifle does not touch the ground. Insert two fingers of right hand under facepiece at right cheek. Pull the facepiece slightly away from right cheek and sniff gently. (Fig. 7.) If gas is smelled, readjust the facepiece and resume the erect position. Close outlet valve by pinching between thumb and fingers of right hand and blow out hard, thus clearing the facepiece of gas. Release hold on outlet valve.

(4) *To remove the mask.*—1. **Remove,** 2. **MASK.** At the command *Remove*, drop the reins behind the pommel of the saddle if mounted; if dismounted place rifle, if unslung, between knees

so that the butt is off the ground; bend forward smartly and insert the left thumb under the pad of the head harness; grasp the headpiece with right hand. (Fig. 8, ①.) At the command **Mask**, lift the headpiece with right hand sufficiently to remove head harness which is carried over the head with a forward circular motion of the left hand, stretching the elastic fabric

only enough to allow the head harness to pass over the head. The mask is retained by the thumb and forefinger of the left hand and held in front of the body. At the same time replace headpiece with right hand. (Fig. 8, ②.)

(5) *To replace the mask.*—1. **Replace**, 2. **MASK**. At the com-



FIGURE 6.—The mask adjusted to the face. (During the drill no equipment should touch the ground which might be contaminated by a liquid agent)



FIGURE 7.—Position in testing for gas. (Knee or equipment should not touch the ground)

mand **Replace**, grasp the facepiece in right hand, palm up, and hold with edges of facepiece turned upward, the fingers under the left eyepiece and thumb under the right eyepiece. With the left hand place head harness pad inside the facepiece just above the eyepieces. With left hand open flap of carrier. (Fig. 9.) At the command **Mask**, feed and slide the corrugated tube into the bottom of the carrier with the left hand until the angle tube

has passed the carrier entrance, then with the right hand turn the edges of the facepiece toward the back of the carrier and push the facepiece into the upper empty part of the carrier about the hose. With both hands fasten the flap of the carrier on both snap fasteners, the top of the flap on the inner or rear snap fastener. If mounted, take the reins. If dismounted, take position of "Trail arms."



① Position at the command *Remove*



② Position at the command *Mask*

FIGURE 8.—To remove the mask

(6) *To unsling the mask.*—1. *Unslung*, 2. *MASK*. At the command *Mask*, unfasten the body straps with both hands and then the shoulder strap with both hands. The mask is retained in the left hand by grasping the metal hook of the carrier just above the flap.

(7) *To prepare for mask inspection.*—The mask being in the slung position, the command is: **PREPARE FOR MASK INSPECTION**. Place rifle (if unslung) between knees so that butt is off

the ground. Unsling mask. Open flap of carrier and take out complete mask, including canister. Hold carrier in left hand and canister with facepiece hanging downward in right hand. (Fig. 10.)

(8) *Mask inspection by the numbers.*—Being prepared for mask inspection: 1. *By the numbers*, 2. *Inspect*, 3. *MASK*. Free right hand by holding canister in left armpit, the hose and facepiece hanging over upper left arm. (Fig. 11, ①.) Examine the sling and the exterior and interior of the carrier in turn to in-



FIGURE 9.—To replace the mask. Position at the command *Replace*



FIGURE 10.—To prepare the mask for inspection. Position at the command *Prepare for mask inspection*

sure that there are no defective or missing parts; that all parts are securely fastened in place; that the body of the carrier contains an antidim tube, and is free from holes, tears, and rips. **TWO.** Fasten the hook and clasp of the shoulder sling together. Slip the left arm through the sling and allow the carrier to hang from over the left shoulder, at the same time removing the mask therefrom by grasping the canister with the right hand. (Fig.

11, ②.) Examine the canister for rust spots and weak places by pressing lightly with the fingers, beginning at the bottom and working toward the top; see that its contents do not rattle on shaking; see that rain shield is not loose and that the inlet valves are present. **THREE.** Adjust the mask to the face. Then pinch together the walls of the hose just above the canister nozzle and inhale. (Fig. 11, ③.) If air can be drawn in, a leak is present, and its approximate location may be determined as follows: Pinch the walls of the hose together at the angle tube. If a leak is no longer detected on inspiration, the leak is in the hose; otherwise it is elsewhere. This inspection is not conclusive as to the absence of a leak in the hose, and such a leak will be determined by the minute inspection indicated below. If the leak is found not to be in the hose, then pinch together the outlet valve at the angle tube and also the hose. If the leak is no longer detected on inspiration, the leak is in the outlet valve below where it was pinched; otherwise it must be above this point or in the facepiece. Having determined the approximate location of the leak, or its absence, next examine the hose for obvious tears, punctures, or other defects. See that it is properly connected to the canister nozzle and to the angle tube and that the adhesive tape over the binding wires is present and in good condition. **FOUR.** Examine the outlet valve for tears and pinholes by distending the rubber between the fingers. (Fig. 11, ④.) Look especially for pinholes just below where the outlet valve is joined to angle tube, and for tears around valve opening. See that valve has no dirt or sand in it and that it is properly connected to the angle tube. See that the binding wire is properly taped. See that outlet valve guard is not loose. **FIVE.** Examine outside of facepiece for tears or other damage to stockinette. See that angle tube is

NOTES.—1. The above drills are designed to teach officers and men to adjust their masks accurately and quickly. The drill must be so thoroughly mastered that all will protect themselves instantly and almost automatically on hearing the gas alarm.

2. Care must be taken to remove the mask without undue stretching of the elastic.

3. After all drills, the inside of the eyepieces should be rubbed with antidiem, leaving a thin, transparent film of the composition on the glass; the inside of the facepiece should be wiped dry; the facepiece folded correctly and put away in such manner that the outlet valve is not bent.

properly connected to facepiece, with rubber band surrounding the binding. See that the fabric has not torn or pulled loose around the eyepiece frames. Examine the chin seam and see that it is in good condition and properly taped inside and outside. Examine the inside of the facepiece for pinholes. (Fig. 11, ⑤.) See that the deflector is in good condition, properly connected to the angle tube, and properly cemented to the sides of the facepiece. Test the entire facepiece fabric for softness and pliability. **SIX.** Examine the head harness. (Fig. 11, ⑥.) Make sure that it is complete, that all its parts are properly attached and are in a serviceable condition. **SEVEN.** All men with defective masks step forward one pace. Others replace mask in the carrier, taking care to replace canister and facepiece in proper position. (Fig. 12.)

37. Inspection, disinfection, and storage of masks.—a. The importance of frequent inspections is apparent when it is remembered that a single defect frequently renders the entire mask unserviceable. The repairs which can be made are limited. Gas mask repair kits are issued which contain all the materials, implements, and directions required for repairing gas masks in the field. In the kit is a book of directions and only those repairs described therein and authorized should be made in the field. Whenever masks are exchanged or used by more than one individual for training purposes or otherwise, they should be disinfected immediately after use. The disinfection should be carried out by the officer in charge as follows:

(1) *Materials required.*—A two per cent solution of cresol or lysol. A supply of small rags.

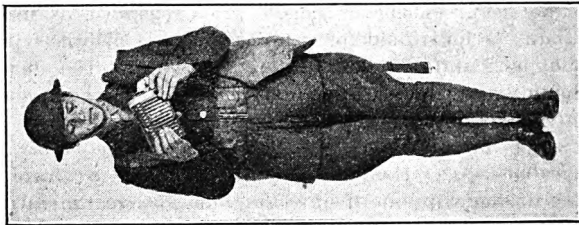
(2) *Directions.*—(a) Hold the mask in the hand, saturate a small piece of rag with the disinfectant and sponge the entire inner surface of the facepiece, including the outer and inner side of the deflector. Then apply the disinfectant similarly to the outside of the outlet valve.

(b) Pour about a teaspoonful of the disinfectant into the exit passage of the angle tube. Press the sides of the outlet valve with the thumb and finger so as to let the disinfectant run out. Do not shake off the excess.

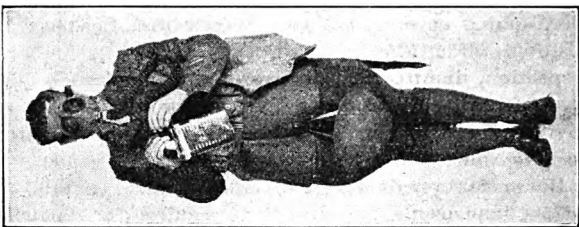
NOTE.—After mask inspection, the men should be given mask adjustment drill once so that it can be readily seen whether all masks have been correctly replaced in the carrier.



① Position at the command *Mask*



② Inspecting the canister at the command *Two*



③ Testing for leaks at the command *Three*



④ Inspecting the outlet valve and guard at the command *Four*

FIGURE 11.—Mask inspection by the numbers



⑤ Inspecting the facepiece at the command *Five*



⑥ Inspecting the head harness at the command *Six*

FIGURE 11.—Mask inspection by the numbers—Continued

(c) Allow all disinfected parts to remain moist for about 15 minutes and then wipe out the inside of facepiece with a dry rag. The mask should dry thoroughly in the air before it is returned to the carrier.

b. While being disinfected, masks should also be inspected for mechanical defects.

c. A metal face form is sometimes furnished to place inside the facepiece when the mask is not in use. When a face form is not available, a wad of newspapers sufficient to fill the inside of the facepiece will serve the purpose. This prevents the facepiece from creasing in storage.

38. Fitting the gas mask.—a. *Facepiece*.—The procedure in fitting facepieces is as follows:

(1) First, estimate the size of the mask to be worn by looking at the contour of the man's face. Gas masks are issued in sizes from Nos. 1 to 4, inclusive, No. 1 being the smallest.

Experience has shown that the percentage of different sizes required by average enlisted men is as follows: Size No. 1, 10 per cent; size No. 2, 50 per cent; size No. 3, 35 per cent; size No. 4, 5 per cent.

(2) Then have the man put on the gas mask. See that the head harness pad is well down on the back of the head. This makes a gas-tight fit at the forehead. Make sure that the eye-



FIGURE 12.—Replacing the canister in the carrier

pieces are directly over the eyes. Next examine the hollows at the temples and cheeks. Other places to watch carefully are where the mask crosses the jaw bone, and under the chin near the Adam's apple. The facepiece should fit snugly throughout. If a snug fit is not obtained, either a smaller mask must be used or the head harness straps adjusted. In adjusting the head harness straps, it is important to see that the facepiece is drawn to the same tightness on both sides of the face; that is, opposite head harness straps must be adjusted to the same length. These straps are the two straps at the sides of the head harness pad, and the two straps at the bottom. If it is necessary to shorten the head harness considerably, the facepiece is too large and the next smaller size should be used.

b. Suction test.—The simplest check on the fit of the mask is the suction test, which is as follows: First, adjust the mask; second, exhale fully; third, pinch the hose and inhale. The facepiece should cling by vacuum to the face, and the wearer should be unable to get air. If the fit appears to be satisfactory, it should then be tested in the gas chamber.

c. Testing in gas.—(1) The next step in the training is a final test of the fit of the mask to the face of the wearer, demonstrating the efficacy of the mask in an atmosphere of gas. Before any gas mask is used for protection against a lethal gas or toxic smoke, inspection of the mask will include a man-

test of the mask in a lacrimatory atmosphere to detect leaks that may have developed due to storage, age, use or deterioration of components or assemblage. A gas chamber is used for this purpose. The gas chamber consists of a room or other inclosure into which a chemical agent may be readily introduced and detected in concentrations which cause only momentary discomfort. The principal purposes which the chamber serves are as follows:

(a) It is a means of testing the fit and adjustment of the mask by exposure to a tear gas while wearing it.

(b) It proves to the individual the fact that his mask really does protect him from gases, and tends to dispel fear of gas.

(2) Any reasonably air-tight room or enclosed space of moderate size will serve as a gas chamber. For training in time of emergency, the chamber should have adequate capacity. As a safety precaution, it should be from 100 to 200 yards away from any other place where personnel will likely congregate. It is desirable that the room be well-lighted (both naturally and artificially). A single room, 12 feet square, of rough timber, covered with tar paper with two doors and a dirt floor is large enough for a regiment. With nothing better available, a wall tent may be used. After a tent is used as a gas chamber, it should be turned wrong side out and left in the sun for several days before other use is made of it. Otherwise subsequent users may be affected by the absorbed gases. The gas chamber is filled with an intolerable concentration of tear gas (chloracetophenone). The contents of a CN capsule or CN crystals (enough to cover a 25-cent piece) are placed on the top of a tin can, in the sides of which holes have been punched, and heated by a lighted candle placed underneath the can. Outside the chamber, the officer in charge puts the men through the gas mask drill and satisfies himself that all men are reasonably well-protected. Men, wearing their masks, are then sent into the chamber in groups of ten or more. A junior officer or sergeant takes station inside the chamber. The men stay in the chamber about five minutes. While there, they talk and move around, but do not tamper with the mask. On emerging from the gas chamber, they move a sufficient distance therefrom to make sure that on removal of mask the eyes will not be affected by fumes leaking from the chamber. They are examined by an officer in charge before they are allowed to take off the mask. He examines the fit of the mask, and then orders the masks

removed, and examines each wearer for signs of lacrimation. The man is asked whether the mask is comfortable. If the pressure on the man's face, shown by the red outline, is not well-distributed or is extreme, the head harness must be loosened or a larger mask used. When the man has detected gas in the chamber, either the head harness must be tightened or a smaller mask used, in which case the test must be repeated in gas.

39. Fitting the horse mask.—In adjusting the horse mask, slip the mouthpiece of the mask well into the horse's mouth, at the same time passing the mouth of the mask over the horse's upper jaw. Pull the draw string tight to secure a snug fit, and slip the elastic straps of the mask harness over the head and behind the ears. The draw string, when tied, should be several inches above the nostrils. At the junction of the burlap front strap and the elastic straps is a flat metal hook which should be fastened to the crown of the bridle.

40. Wearing the mask.—Personnel should be given confidence in the protection offered by wearing the mask. This is accomplished by having the individual man enter the gas chamber, remove the mask and remain there until lacrimation begins. On emerging from the gas chamber, the men should be instructed to face into the wind and blink the eyes to secure quick relief, and under no circumstances to rub the eyes with the hands. This serves as a comparison between no protection and that afforded by the mask. Wearing the mask for long periods results in a noticeable reduction in the individual's efficiency. This loss in efficiency can be minimized, however, by practice in wearing the mask during general work. Just as marches condition men and animals to withstand campaign conditions, the wearing of the gas mask strengthens men's diaphragm muscles and reduces the fatigue of the wearer. The practice should be made easy at first and progressively more difficult by varying the nature of the work performed, as follows: Close order drill, extended drill, physical drills, combat problems, field maneuvers, and night marches. The night march is one of the most difficult things to do while wearing the mask, but its accomplishment is most important, for in actual warfare conditions the individual will often be required to function at night either marching or on fatigue work while wearing the mask. The foregoing applies particularly to dismounted troops. Mounted troops experience less difficulty in wearing the mask while mounted. They should have practice in wearing the mask both mounted

and dismounted. Training in wearing the mask should be conducted for at least one hour per week, and once each month the mask should be worn continuously for one hour. In the event of a mobilization, the troops should wear the gas mask continuously for at least one hour per day for the last week in the training area.

41. Identification of chemical agents.—*a.* An important phase of training in individual protection is the development of the ability of individuals to recognize the presence of chemical agents by their odor. Gas identification sets may be obtained from the division or corps area chemical officer on memorandum receipt. The set consists of four-ounce bottles containing samples of agents, packed in a wooden box. The chemicals are absorbed in a layer of charcoal, and when the bottle is opened sufficient vapor is released so that the odor can be readily detected. The proper method of smelling chemical agents is to take a moderately full breath immediately before opening a sample bottle and sniff gently. As soon as the odor has been detected, replace the stopper in the bottle. There is no danger in connection with smelling chemical agents prepared in this way. Best results are obtained if only one or two agents are sniffed per day. The method of instruction used in sniff bottles is applicable to small groups only and is exceptionally applicable in the training of instructors, hence will usually be limited to use in training gas officers and gas noncommissioned officers.

b. For instructing larger groups, such as a company, there is available an identification set which can be obtained from corps area, department or division chemical officers. This set is called "Set, Gas Identification, Detonation MI", and consists of sealed tubes of the various chemicals. These tubes contain about one ounce of the various agents. In the case of mustard gas and similar agents, the agent is diluted with gasoline, acetone or alcohol so as to produce a five per cent solution of the agent. Two No. 6 detonators are taped to each tube; one of the detonators being connected by wiring, the other detonator is merely taped alongside of the connected detonator. A line of holes about ten yards apart are dug at right angles with the wind direction and one tube of agent is placed in each hole. One tube is sufficient for about 25 men. The class or unit is distributed about 30 or 40 yards down wind. At the signal an assistant detonates the agents by means of an exploder and the instructor causes the students to

sniff the air when the cloud reaches them. As soon as the students have obtained the odor of the agent, they move out of the cloud at right angles to the wind direction.

42. Standard of proficiency.—An organization to be considered proficient in defense against chemical attack must be able to mask automatically at the gas alarm without cessation of the activities on which it is engaged and continue its normal combat activities. The unit gas officer or noncommissioned officer of the organization concerned must be able to answer satisfactorily any questions on the subject and be able to distinguish the odor of the standard chemical agents.

43. Protection of horses and mules.—*a.* Horses and mules are affected by chemical agents in much the same way as man, though differences exist as to the severity of the effect produced in each. For example, while horses and mules can stand a higher concentration of lung irritants or nonpersistent agents than man, they appear to be more susceptible than he to the action of vesicants (blistering agents), which attack the skin. The eye of the horse, also, is more sensitive to vesicants than the eye of the man. However, the horse does not as frequently receive mustard eye injuries as the foot soldier, whose eyes during an advance are closer to the infected terrain and underbrush, than those of the horse. Lacrimators (tear gases) have no effect whatever on horses and mules.

b. The horse mask is used for protection against lung irritants. Due to the difficulties of adjustment this mask is not thoroughly satisfactory. Properly adjusted, however, the mask affords efficient protection. The protective horse boot is used to protect the feet and legs of animals required to cross ground known to be contaminated with a vesicant agent. Most animal casualties from chemical agents result from burns or blisters caused by vesicants, such as mustard gas in the liquid state, which have either been splashed or sprayed directly on the body of the horse or mule, or have been collected on his legs or body from passing over or lying down on infected ground. Blankets and harness which have become contaminated with mustard gas will also cause burns. Gas-infected feed and water cause inflammation of the mouth and digestive system.

c. Mustard gas acts most quickly and severely when the animal is hot and covered with sweat. Surface areas where harness or equipment come in contact with the skin are especially susceptible to severe burns. Saddle galls and harness sores

react to mustard gas and are aggravated by it. Mustard burns, when they develop, resemble rope galls or cracked heels and may be mistaken for them. To be on the safe side, such injuries, if the animal has been subjected to mustard gas, should be treated as mustard burns.

d. Liquid mustard should be promptly washed off with water (and soap if available). The legs and bellies of animals which have crossed contaminated ground should be given this treatment as soon as possible. Particular attention should be paid to the heels and fetlocks (that part just above the hoof). This treatment is not necessary if protective horse boots have been worn. Quite as much care must be exercised, after a mustard gas attack, in cleaning harness and equipment, and in washing and airing saddle blankets.

e. Personnel engaged in washing liquid gas from animals or equipment should wear gas-protective gloves. Under no circumstances should work be undertaken barehanded.

f. A few easily remembered precautions should be taken during operations in which gas is being or may be used:

(1) When consistent with the situation, the eyes of animals should be safeguarded by bandaging them during gas attacks.

(2) Horses and mules, if it can be avoided, should not be taken over ground known to be contaminated with mustard gas. Shell holes or other depressions are especially to be avoided. The protective horse boot should be used when it becomes necessary to cross such ground.

(3) Animals should not be allowed to graze in mustard contaminated areas, nor should they be permitted to drink from shell holes or standing water in such an area. Oats, hay, or other feed which has been contaminated with mustard gas should not be fed to animals. As gas collects in low ground and in woods, it is evident that high unwooded areas are favorable locations for tying animals.

(4) After a mustard gas attack, every effort should be made to clean harness, equipment, and saddle blankets thoroughly. Protective gloves should be worn by personnel engaged in this operation.

44. Protection of pigeons.—Pigeons are highly susceptible to gases which affect the lungs and when such are present, their baskets or cages should be covered with gas-proof covers (pigeon bags). If for any reason the birds can not be protected against the gas, they should be liberated at once.

SECTION VII

ORGANIZATION AND DUTIES OF PERSONNEL

45. Organization for defense against chemical attack.—Organization commanders are responsible for the proper training, instruction, and conduct of operations in their respective commands in defense against chemical attack. However, they have on their staffs specialists in this phase of warfare who act as advisors and assist them as directed. (Fig. 13.)

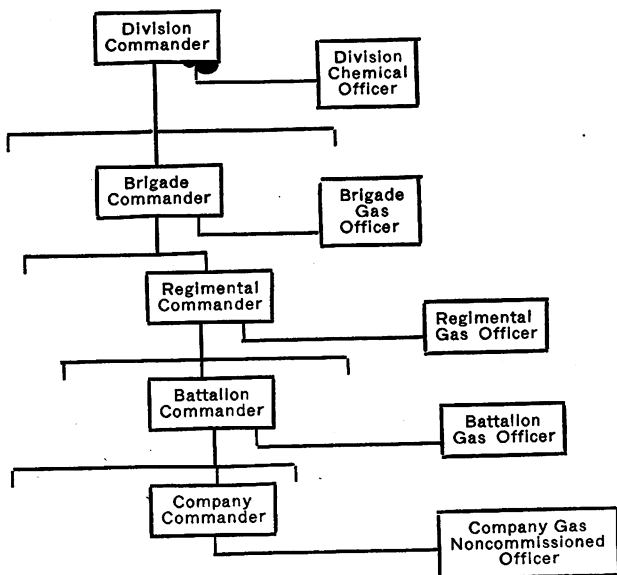


FIGURE 13

46. Division chemical officer.—The division chemical officer is an officer of the Chemical Warfare Service assigned to the staff of the division commander. He is the advisor to the division commander on all matters pertaining to chemical warfare and has three specific functions: Chemical warfare intelligence, training, and supply. Under direction of the division commander and in cooperation with the G-2 section of the Gen-

eral Staff, he gathers information of enemy chemical-warfare activities either through the brigade gas officers, or by direct means, transmits it to higher authority and recommends to the division commander the issuance of such instructions to subordinate units as are necessary in each instance. He cooperates with the G-3 section in matters of chemical-warfare training; recommends such procedure as is necessary in operations to insure defense against chemical attack, and exercises, in the name of the commander, a general supervision over all chemical defensive activities of the division. It is a part of the duty of the division chemical officer to prepare a standing order for defense against chemical attack for his division. Such an order should be prepared as soon as a newly mobilized division commences to function as such. These orders apply to all routine measures of individual and collective protection which are independent of the tactical situation. He determines whether or not gassed areas are fit for occupation; in the event they are not, posts same and warns the command of their location. The division chemical officer is the division supply officer for chemical warfare items of protective equipment. In this function, through the division G-4, he requisitions supplies from the Army and issues to regiments and separate units within the division.

47. Brigade gas officer.—The brigade gas officer is an officer of the arm represented, detailed by the brigade commander as brigade gas officer. The functions of the brigade gas officer within the brigade are, in addition to his other duties, of the same general nature as those of the chemical officers of higher units.

48. Regimental and battalion gas officers.—*a.* Each regiment and battalion will have, at all times, one officer and one noncommissioned officer who are qualified instructors, and each company will have two noncommissioned officers. The work of the unit gas officer differs from that of the division chemical warfare officer in that it is mainly limited to protection against chemical attack. The duties of the regimental and battalion gas officers are so closely related that it is impossible to make a specific division of duties which will be a logical one under all circumstances. Sometimes the situation may demand that duties normally performed by the regimental gas officer be allotted to one of the battalion gas officers, or vice versa. Gen-

erally speaking, the best policy for the distribution of these duties between the regimental gas officer and the battalion gas officer is to have the former responsible for inspections and intelligence, and the latter for the work of training and for the handling of the situation during actual operations. The regimental officer will, of course, exercise general supervision over the work in connection with defense of chemical attack within the regiment and will distribute the actual carrying out of these duties as described above. The most important of the duties to be performed by these officers are as follows:

(1) Report all gas shelling promptly, giving time, location, weather, wind, and number, size and kind of shells used, and casualties.

(2) Report immediately any mustard gas shelling in the unit area.

(3) Report promptly all changes in gas personnel.

(4) Report name, grade, and organization of all officers violating standing orders for protection against chemical attack.

(5) Insist on daily inspection of masks by soldiers in actual combat and weekly inspection by all troops in areas where the mask is required to be carried. Check up these inspections personally to be positive they are being carried out.

(6) Make sure by frequent inspections and tests that alarms in the unit area are adequate and in working order.

(7) Inspect all gas sentries. Frequent inspection of all sentries is mandatory. They must be thoroughly familiar with all their duties. They must know all standing orders for protection against chemical attack. They must know how to detect a gas attack, how and when to give the alarm, and when to awaken sleeping men over whom they may be posted.

(8) Make sure that no men in the unit area are permitted to sleep without a sentry knowing where they are.

(9) Question and instruct all gas noncommissioned officers frequently, reporting those (by name, grade, and organization) considered incapable, those who neglect their work, those who have too many other duties to perform, and those who show special aptitude.

(10) Make sure that all lower units in the unit area are known.

(11) Submit a brief report each week covering the work done during the week as gas officer. This includes the nature of all duties performed and the amount of time required for same.

b. The regimental gas officer supervises the supply of his regiment with equipment for protection against chemical attack. It is his duty to assure himself by inspections that the regiment has sufficient supply of protective matériel and that this matériel is in good condition.

c. An efficient battalion gas officer can do more to prevent gas casualties than any other officer engaged in problems of chemical warfare. When the division is not in action, the time of the battalion gas officer is entirely taken up with instruction and training. The regimental gas officer supervises carefully this work. A thorough and rigid inspection is also held at this time as to the condition and amount of all protective equipment within the battalion.

d. When the division first goes into action, the battalion gas officer must immediately carry out a careful reconnaissance. He must make a careful study of the terrain and thoroughly familiarize himself with the topography of the area in which the battalion is to operate. He then is prepared to make recommendations as to the safety and suitability, from a chemical warfare point of view, of the places that are to be occupied by the different elements of the battalion. He also makes recommendations as to the troop movements and other tactical measures which should be taken in the event of a gas attack by the enemy. In short, he prepares the battalion plan of protection. This plan after approval is sent back through channels to be incorporated into the regimental or division plan of defense against gas.

e. A sharp watch over meteorological conditions must always be kept by the battalion gas officer when troops are in contact with an enemy, and the troop commanders should always be warned where and when conditions are favorable for an enemy attack. During an actual chemical attack the real value of the battalion gas officer becomes most apparent. He is often the only officer trained in chemical warfare at the scene of action in time to witness the attack from start to finish. He is consequently able to obtain important information that otherwise might be overlooked and can make the proper recommendations without delay. In taking the proper tactical measures for protection against chemical agents during the actual gas attack, the most important factor is speed. If the proper thing is to be done at all, it must be done quickly or else it is of no use. Troops exposed to a gas attack must, therefore,

depend for advice largely upon the battalion gas officer. The regimental gas officer or division chemical warfare officer can assist in advance preparations or can criticise and help correct deficiencies after an attack. During the actual attack, however, the problem will usually be that of the battalion gas officer alone.

f. In the case of artillery, the distribution of duties between the regimental and battalion gas officers is of less importance. As long as the work is done, it makes little or no difference whether the regimental officer does it himself or has it done by his battalion officers. While the artillery gets fully as much gas as the infantry, nevertheless, the problem of artillery gas officers is not so difficult, owing to greater ease of communication and simplicity in the problems of evacuation. The artillery troops themselves, however, have a disadvantage regarding the use of chemical agents by the enemy which the infantry usually does not have, namely, they are more likely to be shelled by large caliber guns containing large amounts of chemical agents. Also, after a chemical attack, it is a great problem to clean, oil and care for the artillery equipment which has been exposed to the action of the chemical agents.

g. It is the duty of regimental and battalion gas officers to see that any attached units operating within their organization are properly equipped and inspected. The responsibility for this must be put squarely up to such gas officers, as there is no one else to see that these men are properly protected.

49. The company gas noncommissioned officer.—The company gas noncommissioned officer is a noncommissioned officer from the company appointed by the company commander. He assists the company commander in all matters pertaining to defense against chemical attack. Under direction of the company commander, he has three specific functions—chemical warfare intelligence, instruction and inspections, and supply and repair. Acting under the direction of the company commander, he is charged with identification of enemy chemical agents, and the detection and posting of gassed areas. He assists the battalion gas officer when in the company area in obtaining specific chemical warfare information. He assists the company and platoon commanders in inspecting the fit and state of repair of masks, and acts as assistant instructor in gas mask drill and identification of agents. The company gas noncommissioned officer acts as maintenance sergeant for chemical warfare items of

protective equipment and in so far as it is possible with the repair sets furnished for that purpose, keeps them in a serviceable state of repair. He makes frequent inspections of gas sentries and instructs them in their duties; inspects the alarm system, gas proof shelters, protection of food and water, and warns the company commander when terrain and weather conditions are favorable for enemy gas attacks. He supervises the disinfection of small important localities.

50. Gas sentries.—In addition to their other duties all sentries act as gas sentries. Special gas sentries are also posted where needed. The gas sentry always on the alert to detect the presence of gas affords a sense of security to the other men of the command, and permits them to gain much-needed sleep and rest. This is his most important function. Provision must be made for posting an adequate number of gas sentries over sleeping troops and working parties in the theater of operations. This number should be sufficient to insure that every sleeping man shall be awakened in time and every man engaged in work warned in time. Each gas sentry should be equipped with an alarm horn, should have a definite area to alarm, should know when to give the gas alarm, and should know where every man in his area is sleeping. In the event of a gas attack, the gas sentry will adjust his mask, sound the alarm, and immediately proceed to wake up every man in his area. The gas sentry will not pass on alarms arising in other areas, but will give the alarm only when he, himself, detects the presence of gas. This precaution is necessary in order to prevent the spreading of false alarms, and will be strictly adhered to except in the case of a general gas alarm. Standing orders of all units will prescribe the duties of the gas sentry in cases of general gas alarms, and it is the duty of all officers in charge of such sentries to insure that the sentries understand these instructions. (Par. 30.) In addition to their other duties, gas sentries are responsible that standing orders for defense against chemical attack are complied with, and that all cases of infringement of these orders are promptly reported. Gas sentries on duty at distributing points should have impermeable clothing and masks available. Such installations will be chiefly the targets of enemy attack aviation employing vesicant spraying devices. The primary duty of these sentries is to protect the supplies. Since such an air attack develops very fast, the gas

sentry has only a few seconds to pull the paulins into position. He should therefore be in a state of readiness to act at an instant's notice.

SECTION VIII

RULES TO BE REMEMBERED

51. Rules to be remembered.—*a.* Do not carry anything in your gas mask carrier but the mask.

b. Do not neglect the gas mask or allow it to receive rough handling.

c. Do not throw away your gas mask. You may need it later on and it will save your life.

d. Do not give a false gas alarm.

e. Do not breathe after the gas alarm is given until you are sure that your mask is well adjusted to your face and that the facepiece has been cleared of gas by blowing vigorously into the facepiece while holding the outlet valve.

f. Do not remove your gas mask until permission to remove it is given by an officer or a gas noncommissioned officer.

g. Do not enter a dugout during or immediately after a chemical attack.

h. Do not remain in a GAS-PROOF DUGOUT during or immediately after a gas attack with mask removed unless absolutely necessary.

i. Do not talk or move about unnecessarily during a gas attack.

j. Do not become panicky; keep cool and remember your protective equipment will save you if properly used.

k. Do not fail to realize that the enemy uses many different kinds of gases, sometimes alone; at other times mixed with other chemical agents, smoke, or high explosive.

l. Do not forget that clothing contaminated with mustard gas should be removed as soon as possible.

m. Do not remove another man's clothing or handle equipment that is contaminated with mustard gas unless you are equipped with protective gloves or clothing.

n. Do not forget that mustard gas remains in an area for days.

o. Do not enter an area contaminated with mustard gas unless equipped with protective clothing and gas mask.

p. Do not remain for any length of time in an area contaminated with mustard gas even if equipped with protective clothing and gas mask.

q. Do not fail to post a gas sentry over sleeping men and working parties.

r. Do not forget that when the wind is blowing from the enemy between 3 to 12 miles per hour a cloud chemical attack from the enemy may be expected.

s. Do not forget that during a calm, in foggy or cloudy weather, a drizzling rain, and at night, ideal conditions exist for a chemical attack. Be on the alert.

t. Do not allow your men to drink water or eat food contaminated with chemical agents.

u. Do not forget that all gas cases require first, rest; second, warmth; third, fresh air.

v. Do not permit gassed men to walk, talk, or move about.

w. Do not bandage the eyes of a gas casualty.

x. Do not forget that good sense and good judgment are essential for defense against chemical agents.

y. Do not fail to keep thoroughly posted in all matters pertaining to chemical warfare.

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WAR DEPARTMENT

BASIC FIELD MANUAL



Volume I

FIELD SERVICE POCKETBOOK

CHAPTER 8

DEFENSE AGAINST CHEMICAL ATTACK

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BASIC FIELD MANUAL

VOLUME I

FIELD SERVICE POCKETBOOK

CHAPTER 8

DEFENSE AGAINST CHEMICAL ATTACK

CHANGES }
No. 1 }

WAR DEPARTMENT,
WASHINGTON, May 25, 1939.

Basic Field Manual Volume I, Chapter 8, December 31, 1937,
is changed as follows:

11. Attacks from aircraft; chemical bombs or spray.

* * * * *

b. Spray attacks.—(1) The agents most likely to be used for spray attacks are mustard, lewisite, and any type of liquid smoke. Attack aircraft flying between 50 and 1,000 feet can lay a belt of persistent gas in an effective concentration on the target. The actual length of the area covered will depend upon the capacity of the tanks used, their number, the rate of discharge, and the ground speed of the airplane. The actual width of the area covered will depend on the above factors, the altitude of the airplane, and the course of the airplane in relation to wind direction. The belt will be wider when the airplane flies perpendicular to the wind direction than when it flies parallel to that direction. The average area covered by one attack airplane may be taken as 800 yards long and 300 yards wide. The drops will be larger on the upwind side, gradually getting smaller downwind across the target. Larger drops are more effective than smaller drops.

* * * * *

[A. G. 062.11 (4-8-39).] (1939.)

16. General effects of weather and terrain on chemical attacks.

* * * * *

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b. Temperature.

* * * * *

(2) Substances like mustard gas may freeze in the soil. When mustard gas freezes, it is much less effective. However, the vaporization is still sufficient, except in subfreezing weather, to produce casualties if personnel are exposed for a considerable period. It must be kept in mind that solid particles of frozen mustard gas may become attached to clothing while passing through undergrowth and these particles will cause burns if they come in contact with the body.

* * * * *

[A. G. 062.11 (4-8-39).] (1939.)

25. Decontamination.

e. Materials.

* * * * *

(6) An additional material known as agent, decontamination, noncorrosive, is prepared by dissolving 1 pound of solid in 15 pounds of solvent. This agent is much less corrosive than any of those mentioned. It is suitable for use on leather, cotton fabrics, instruments, and other items that might be damaged by the corrosive action of bleaching powder or other chemically active decontamination materials.

* * * * *

[A. G. 062.11 (4-8-39).] (1939.)

29. Gas mask drill.

* * * * *

b. Commands.—(1) *To sling the mask.*—1. *By the numbers, 2. Sling, 3. MASK.* At the command *Mask*, * * * together in front.

* * * * *

(4) *To remove the mask.*—1. *By the numbers, 2. Remove, 3. MASK.* At the command *Mask*, * * * of the body.

(5) *To replace the mask.*—1. *By the numbers, 2. Replace, 3. MASK.* At the command *Mask*, retain the facepiece in right hand, palm up, and hold with edges of facepiece turned upward, the fingers under the left eyepiece and thumb under the right eyepiece. With the left hand place head harness pad inside the facepiece just above the eyepieces. With the left hand open flap of carrier. With the right hand bring the facepiece toward

the carrier. With the left hand loop the hose tube over the outlet valve guard and through the facepiece, holding the tube in this position with the thumb and fingers of the right hand just below the eyepieces (fig. 9). Place left hand on flap of carrier.

TWO. Push the hose and facepiece into the upper empty part of the carrier, permitting the hose to slide into its proper place in the carrier. See that the hose tube is not crimped and that the facepiece is in its proper position. With both hands fasten the flap of the carrier on both snap fasteners, the top of the flap on the inner or rear snap fastener. If mounted, take the reins. If dismounted, take position of *trail arms*.

* * * * *

(8) *Mask inspection*.—Being prepared for mask inspection, **1. By the numbers, 2. Inspect, 3. MASK.** At the command *Mask*, * * * valves are present.

THREE. * * * Having determined the approximate location of the leak or its absence, remove facepiece and examine the hose for obvious tears, punctures, or other defects. See that it is properly connected to the canister nozzle and to the angle tube and that the adhesive tape over the binding wires is present and in good condition.

FOUR. Place canister under left armpit. Examine the outlet * * * the proper position.

[A. G. 062.11 (4-8-39).] (1939.)

33. Care of the gas mask.

* * * * *

h. Storage.—(1) * * *

* * * * *

(d) When the facepiece is in the carrier, keep the hose tube well rounded in the bottom of the carrier, thus preventing pressure on the tube by the outlet valve guard and subsequent collapse of the tube.

* * * * *

(2) Gas masks issued to organizations in garrison should be placed in storage racks. These racks, constructed as shown in figures 10 and 11, hold the masks in such manner that collapse of the hose or creasing of the facepiece is impossible.

[A. G. 062.11 (4-8-39).] (1939.)

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44. Regimental and battalion gas officers.—a. Each regiment and battalion will have at all times one gas officer and one gas noncommissioned officer who are qualified instructors, and each company will have two gas noncommissioned officers. These officers and noncommissioned officers are members of the branch represented and are detailed by, and, unless otherwise directed, submit all reports to their respective commanders. The work performed * * * officers will overlap.

* * * * *

[A. G. 062.11 (4-8-39).] (1939.)

BY ORDER OF THE SECRETARY OF WAR:

MALIN CRAIG,
Chief of Staff.

OFFICIAL:

E. S. ADAMS,
*Major General,
The Adjutant General.*

BASIC FIELD MANUAL



Volume I FIELD SERVICE POCKETBOOK

CHAPTER 8 DEFENSE AGAINST CHEMICAL ATTACK

**Prepared under direction of the
Chief of the Chemical Warfare Service**



**UNITED STATES
GOVERNMENT PRINTING OFFICE
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WAR DEPARTMENT,
WASHINGTON, December 31, 1937.

Chapter 8, Defense Against Chemical Attack, Basic Field Manual, volume I, Field Service Pocketbook, is published for the information and guidance of all concerned.

[A. G. 062.11 (10-19-36).]

BY ORDER OF THE SECRETARY OF WAR:

MALIN CRAIG,
Chief of Staff.

OFFICIAL:

E. T. CONLEY,
Major General,
The Adjutant General.

(II)

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CHAPTER 8

DEFENSE AGAINST CHEMICAL ATTACK

(This pamphlet supersedes chapter 8, Basic Field Manual, volume I, December 3, 1931 (including C1, October 16, 1935); and section IV, TR 155-5, July 15, 1926.)

SECTION I

GENERAL

1. Object of instruction.—The object of instruction and training in defense against chemical attack is to—

- a.* Minimize casualties from enemy chemical attacks.
- b.* Prevent undue interruption to normal military action during combat.

2. Scope of instruction.—The scope of instruction includes—

- a.* A description of the chemical agents that may be encountered in the field, their properties and physiological effects.
- b.* Effects of weather and terrain on the use of chemical agents.
- c.* Methods of projecting chemical agents.
- d.* Use and care of protective equipment.
- e.* Methods of decontaminating areas and equipment.
- f.* First-aid treatment for gas casualties.
- g.* Organization and duties of individuals in defense against chemical attack.
- h.* Duties of gas sentries.
- i.* Tactical protective measures against chemical attacks.

3. Standards of proficiency.—*a. The individual.*—The individual soldier will be proficient in the essentials of defense against chemical attack described in sections I to VII, inclusive. In addition, officers and gas noncommissioned officers will be proficient in their duties as prescribed in sections VIII and IX.

An outline of standards of proficiency in the protection of the individual is given below:

(1) *Chemical agents*.—(a) Ability to identify the agent in the field by odor, color, and physical state.

(b) Knowledge of—

1. Persistency of the principal gases.
2. Effect produced on the body upon contact with the agent.
3. Protection required against all classes of agents.
4. Methods of decontaminating areas and equipment.

(2) *First-aid treatment for gas casualties*.—(a) Recognition of the effects of agents.

(b) Differentiation between seriously and slightly gassed cases.

(c) Application of remedial measures pending medical aid.

(3) *Protection*.—(a) *Gas mask*.

1. Proficiency in gas-mask drill.
2. Knowledge of the kind and degree of protection afforded by the gas mask.
3. Knowledge of when to use and remove the gas mask.
4. Ability to take proper care of the gas mask.

(b) *Protective clothing*.

1. Knowledge of when and how to use protective clothing.
2. Knowledge of the proper care of protective clothing.

(c) *Gas-proof shelters*.

1. Knowledge of requirements to make a shelter gas-proof; methods of entering and leaving gas-proof shelters; method of clearing gas from shelters.
2. Ability to determine the presence of gas in a shelter.

(d) *Protection of animals*.

1. Knowledge of the use of protective equipment for animals.
2. Ability to assist the animal in securing protection.

(4) *Duties of gas sentries*.—(a) Ability to detect agents in the field by odor, color, and physical state, sounding the gas alarm only when necessary.

(b) Knowledge of weather and terrain conditions favorable for enemy attack by chemical agents.

(c) Ability to recognize sounds indicating probable projection of chemical agents by the enemy.

b. The organization.—The proficiency of an organization in defense against chemical attack depends primarily on the proficiency of every member thereof as prescribed in *a* above. In addition, it requires the availability of the prescribed quota of gas officers and gas noncommissioned officers, and the necessary number of trained gas sentries and gas reconnaissance personnel to meet the probable requirements of combat. It also includes the maintenance in serviceable condition of adequate protective clothing, protective equipment, and protective supplies and the training of the unit as a whole so that it will efficiently take the collective measures and carry out the tactical procedure prescribed herein.

SECTION II

PRINCIPAL CHEMICAL AGENTS

4. Definitions.—A *chemical agent* is a substance which, after release and acting directly through its chemical properties, is capable of disabling man or beast.

a. A persistent agent is one whose period of effectiveness extends beyond 10 minutes. Some persistents last for days and even weeks.

b. A nonpersistent agent is one whose effectiveness is dissipated within 10 minutes after release.

c. An irritant agent is one whose effectiveness is limited to intense temporary irritation of some portion of the body yet without producing serious after effects.

d. A smoke is a chemical agent used to blind hostile observation. With the exception of the burning action of particles of phosphorus, smokes have little or no injurious effect on personnel.

e. An incendiary is a chemical agent used primarily for setting fire to matériel.

5. Classification.—*a. Physical state.*—Chemical agents may be encountered as gases, liquids, or solids. This classification is based on their physical condition at ordinary temperatures likely to be encountered in the field.

b. Physiological effect.—Chemical agents affect particular parts of the body in several ways. They are classified for these physiological effects as follows:

(1) *Lung irritant*.—A chemical agent which, when breathed, causes irritation and inflammation of the interior cavity of the bronchial tubes and the lungs.

(2) *Vesicant*.—A chemical agent which is readily absorbed or dissolved in the exterior parts of the body, followed by the production of inflammation, burns, and the destruction of tissue.

(3) *Irritant*.—A chemical agent that irritates either exterior or interior body surfaces producing intense though temporary discomfort. The irritants are subdivided into the following two distinct groups:

(a) *Irritant smoke*.—An agent, disseminated as a smoke, which causes intense sneezing, coughing, or headache.

(b) *Lacrimator*.—An agent which causes a copious flow of tears and intense, though temporary, eye pains.

(4) *Incendiary*.—A chemical agent capable of producing severe heat burns upon contact with the body.

c. *Tactical use*.—Chemical agents are classified in accordance with their principal tactical use as follows:

(1) *Casualty agent*.—An agent which is used to produce casualties of such severity as to require evacuation.

(2) *Harassing agent*.—An agent which is used to force masking, thereby reducing the efficiency of the opposing forces.

(3) *Screening agent*.—An agent which is used to produce a smoke of such density as to prevent or interfere with observation.

(4) *Incendiary*.—An agent which is used to set fire to enemy matériel or supplies.

6. *Characteristics of principal chemical agents*.—The following tables give in brief form the practical information on chemical agents needed in the application of defensive measures against chemical attack. The agents listed are the principal types in each class and are therefore the most likely to be used in future warfare. Since other agents that may be employed are likely to be variations of these types, a knowledge of the protective requirements for the agents shown will be of considerable value in meeting any problems of protection that may arise.

LUNG IRRITANTS

NAME and SYMBOL.	CHLORINE (Cl)	PHOSGENE (CG)	CHLORPICRIN (PS).
Odor	Disagreeable, pungent	Disagreeable, pungent, like new cut hay or cut corn.	Sweetish, like fly paper.
Color and state in field	Greenish yellow gas	First white, changing to colorless gas.	Only liquid changing slowly in open to colorless gas.
Effects on body	<i>Lung irritant.</i> Causes coughing, smarting of eyes, discomfort in chest, followed by nausea and vomiting. A 2-minute exposure to an average field concentration produces a casualty. Effects begin immediately.	<i>Lung irritant.</i> Choking, coughing, vomiting, hurried breathing, pains in chest due to irritation of lower lungs. Approximately 11 times more toxic than chlorine; a few breaths in average field concentration produce a casualty. Effects begin immediately but progress slowly.	<i>Lung irritant and lacerimator.</i> Lacerimation, coughing, nausea, vomiting, lung irritation. Approximately $\frac{1}{4}$ as toxic as phosgene.
Persistence	Drifts as gas with the wind but being heavier than air clings for some time in trenches, shell holes, woods, and other low or protected places. In unprotected places—General: 5 minutes.	In summer, dispersed as gas much heavier than air; in winter, as liquid, changing over period of few minutes to gas. Gas remains considerable time in low or protected places. In unprotected places—Summer: 5 to 10 minutes. Winter: 20 minutes.	Dispersed as liquid, changing to gas over period of several hours. Heaviest gas concentration produced when shell bursts. Persistence in woods and protected places considerably extended. In unprotected places—Summer: 2 hours. Winter: 12 hours.
Action on food	Contaminates. In some cases may be removed by ventilation and heating but taste remains disagreeable.	Contaminates. In some cases may be removed by ventilation and heating but taste remains disagreeable.	Contaminates. In some cases may be removed by ventilation and heating but taste remains disagreeable.

LUNG IRRITANTS—Continued

Action on metal..... How used.....	Dry, none; wet, vigorous corrosion.. <i>For casualty effects.</i> In cloud gas attacks as substitute for phosgene or mixed with phosgene or chlorpicrin in cylinders or Livens projectors. Gas mask.....	Dry, none; wet, vigorous corrosion.. <i>For casualty effects.</i> In cloud gas attack in cylinders, projectors, medium artillery, mortars, and aviation bombs. Gas mask.....	Slight tarnish only. <i>For harassing and casualty effects.</i> In shell, bombs, or airplane spray as substitute for other agents; in like manner mixed with CN; in cloud attacks mixed with Cl. Gas mask.
Protection required.....			

VESICANTS

NAME and SYMBOL.....	LEWISITE (M1).....	MUSTARD (HS).....
Odor.....	Like geraniums, then biting.....	Like garlic or horseradish.
Color and state in field.....	Dark brown liquid, changing slowly into a colorless gas.....	Dark brown liquid, changing slowly into a colorless gas.
Effects on body.....	<i>Vesicant, blisters skin.</i> Skin shows slight irritation in 15 minutes followed by grayish discoloration and blisters in 30 minutes to 1 hour. Systemic poisoning, vomiting. If breathed, powerful lung irritant effects within 1/2 hour. If unprotected, immediate irritation of eyes. Gas approximately 4 times as toxic as phosgene.	<i>Vesicant, blisters skin.</i> Symptoms delayed 2 to 4 hours. If exposed, eyes burn and inflame. Skin, in contact with gas or liquid, discolors, followed by blisters and sores. If breathed, hoarse cough develops followed by severe pain in chest and inflammation of lungs. Gas approximately 3 times as toxic as phosgene.
Persistence.....	Dispersed as liquid which slowly changes to gas. Heaviest gas concentration produced when shell bursts. Rate of vaporization depends on temperature, vegetation, and method of dispersion. Summer: 24 hours in open; 2 or 3 days in woods. Winter: Several weeks.	Dispersed as liquid which slowly changes to gas. Heaviest gas concentration when shell bursts. Rate of vaporization depends on temperature, vegetation, and method of dispersion. Summer: 3 to 4 days in open; 1 week in woods. Winter: Several weeks.
Action on food.....	Poisons unprotected food. Cannot be made suitable for use.	Renders unprotected food unfit for use.
Action on metal.....	Very slight.....	Very slight.
How used.....	<i>For casualty effect</i> or to deny ground through threat of casualties. In artillery shell, mortar shell, airplane bombs, airplane spray, and land mines.	<i>For casualty effect</i> or to deny ground through threat of casualties. In artillery shell, mortar shell, airplane bombs, airplane spray, and land mines.
Protection required.....	Gas mask and protective clothing.....	Gas mask and protective clothing.

IRRITANTS

NAME and SYMBOL. Odor..... Color and state in field..... Effects on body..... Persistency.....	ADAMSITE (DM)..... Not definite; slightly like coal smoke. A yellow smoke cloud..... <i>Irritant smoke.</i> Immediate sneezing, followed by headache, nausea, and vomiting; temporary physical debility. Effective in extremely low concentrations. Drifts with wind. Will remain in low and protected places for some time. General— 5 minutes in open.	CHLORACETOPHENONE (CN)..... Like apple blossoms..... Bluish gray smoke from the burning powder. <i>Irritant gas.</i> Piercing irritation of eyes causing profuse tears. Effective in extremely low concentrations. Drifts with wind. Will remain in low and protected places for some time. General— 5 minutes in open.	TEAR GAS SOLUTION (CNS). Like fly paper. A colorless liquid, changing to colorless gas. <i>Irritant gas.</i> Piercing irritation of the eyes, profuse tears, followed by nausea and vomiting. Dispersed as liquid which changes to gas. Greatest concentration of gas when shell bursts. General— Summer: 1 hour in open; 2 hours in woods. Winter: 6 hours in open; 1 week in woods. Contaminates. In some cases may be removed by ventilation and heating. Tarnishes steel slightly. <i>For harassing effect.</i> In artillery shell, mortar shell, airplane bombs, and airplane spray. Gas mask.
Action on food.....	Poisons unprotected food; cannot be made safe for use.	Gives unprotected food disagreeable odor.	
Action on metals..... How used.....	Tarnishes slightly..... <i>For harassing effect.</i> In candles.....	Tarnishes steel slightly..... <i>For harassing effect.</i> In grenades.....	
Protection required.....	Gas mask with good filter.....	Gas mask with good filter.....	

SCREENING SMOKE

NAME and SYMBOL	SULPHUR TRIOXIDE SOLUTION (FS)	HC MIXTURE	WHITE PHOSPHORUS (WP).
Odor	Acid or acid.	Acrid, suffocating.	Like phosphorus matches.
Color and state in field	Dispersed as liquid which changes to white smoke upon contact with air.	White smoke produced by burning munitions only.	Dispersed as solid which rapidly changes to flame and white smoke on contact with air.
Effects on body	Mild pricking sensation to skin; noninjurious.	None	Smoke, none; particles produce severe fire burns which heal very slowly.
Persistency	Drifts with wind. Persists only while container is discharging.	Drifts with wind. Smoke remains at point of release during burning time only.	Smoke drifts with wind; solid particles give off smoke until consumed, about 1 to 2 minutes after shell burst.
Action on food	Liquid renders food unfit for use; smoke gives disagreeable odor.	Smoke gives disagreeable odor.	Smoke gives disagreeable odor; solid is poisonous.
Action on metal	Vigorous corrosion in presence of moisture.	None, if dry	None.
How used	for screening; in airplane spray mortar shell, and cylinders for training to simulate cloud gas.	<i>Screening smoke.</i> In smoke pots or candles, for training only.	<i>Screening smoke and incendiary.</i> In artillery shell and mortar shell, primarily for smoke effect; also used in same munitions and airplane bombs for casualty effect and incendiary action.
Protection required	None	None	For smoke, none; for burning particles, none provided.

SECTION III

USE OF CHEMICAL AGENTS IN THE FIELD

7. Object of chemical attack.—Chemical attacks are made with the following objects in view:

- a. To inflict casualties.
- b. To deny certain areas to an opposing force through threat of casualties.
- c. To contaminate matériel and supplies.
- d. To harass by forcing the opposing troops to mask, thereby reducing their efficiency.
- e. To affect morale.
- f. To interfere with observation by smoke.
- g. To destroy matériel and supplies by incendiary action.

8. Methods of projecting chemical agents.—Chemical agents may be projected by the following methods:

- a. From artillery shell and chemical mortar shell.
- b. From chemical projector shell.
- c. From aircraft, either in bombs or as a spray.
- d. From cylinders or gas candles in the form of a cloud.
- e. From bulk containers and chemical land mines placed in position and fired statically.
- f. Sprayed from vehicles.
- g. From hand and rifle grenades and smoke pots.

9. Chemical artillery and mortar shell attacks.—*a. Artillery shell.*—(1) The use of artillery gas shell is in large measure independent of wind direction, though not of wind velocity. Persistent agents of the mustard gas type are suitable for projection from light artillery. Nonpersistent agents of the phosgene type are suitable for projection from medium artillery.

(2) Before troops attack, only nonpersistent gases are likely to be used on the area over which the attack is to be made, although persistent agents may be used on other areas.

(3) The chemical content of artillery shell is small when compared by weight with other chemical containers. To produce an appreciable effect, chemical artillery shell must, therefore, be used in large numbers.

(4) The agents most likely to be projected by 75-mm shell are those of high persistency. The explosion of the shell upon impact throws the agent over an area approximately 14

yards in diameter. The agents most likely to be projected by the 155-mm shell are mustard, lewisite, phosgene, and white phosphorus. Upon explosion of the 155-mm shell, the agent is thrown over an area approximately 50 yards in diameter. With both the 75-mm and the 155-mm shell, the area over which the agent is thrown is not centered on the point of impact but is generally slightly forward of the point of impact and slightly elongated in the direction of fire.

b. Mortar shell.—(1) Up to ranges of 2,400 yards, the chemical mortar can establish and maintain heavy concentrations of both persistent and nonpersistent gas. It is also suitable for firing white phosphorus for both smoke and casualty effects.

(2) The agents most likely to be used in mortars are mustard, lewisite, phosgene, and white phosphorus. The explosion of the shell of the 4.2-inch chemical mortar upon impact throws the agent over an area approximately 40 yards in diameter. (See fig. 1.)

c. Danger areas.—(1) Any point within the radius of burst of chemical shell, either artillery or mortar, is a danger area; and any person within such area may become a casualty unless proper protective measures are taken immediately.

(2) There is also a danger area extending down wind from the area of burst. In the case of the nonpersistent agents, upon the explosion of the shell the liquid almost instantaneously changes into a gas and is borne down wind at the speed of the wind. This gas cloud spreads at about the rate of 15 percent of the distance traveled. It eventually becomes so thinned out by spread, settling out, and other causes, that the concentration is too weak to cause casualties. The distance down wind that the cloud is effective varies from two or three hundred yards for a single large caliber shell to several miles in the case of heavy concentrations over a wide front.

(3) In the case of the persistent gases, upon the explosion of the shell a portion of the liquid changes immediately into a gas and a portion is so finely atomized that it, too, travels with the wind. The remainder, in liquid form, is distributed over the ground and slowly changes into a gas, the rate depending upon the temperature. There is thus an extremely dangerous area down wind immediately after the burst of a mustard-gas shell.

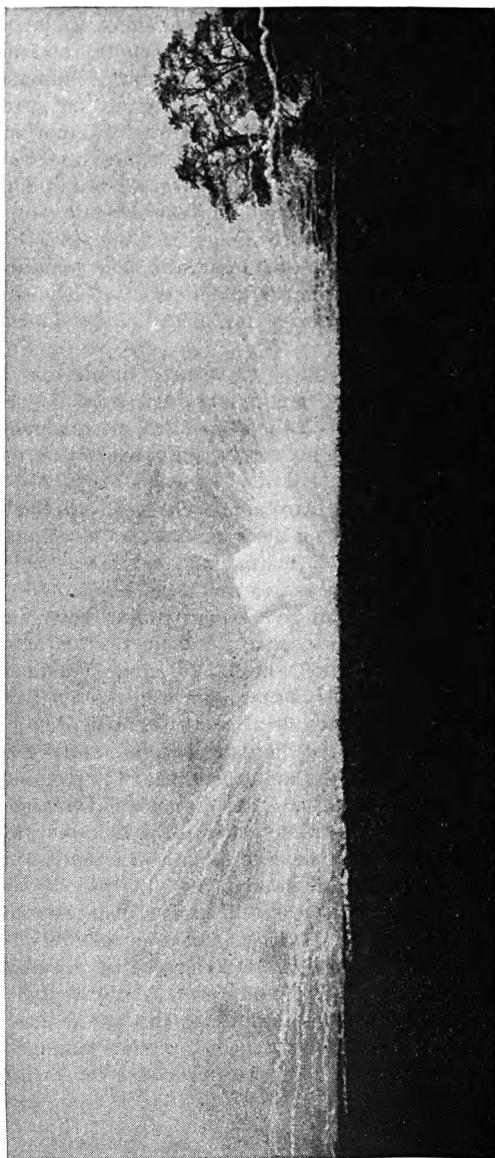


FIGURE 1.—Burst of a white phosphorus filled 4.2-inch chemical mortar shell.

Thereafter, until vaporization is complete, there continues to be an area down wind where there is a constant flow of mustard vapor; however, the concentration is much less and the effective distance down wind much less than that immediately following the burst of the shell.

(4) The distance down wind that a gas of high persistency is effective immediately following the burst of shell is considerably less than that of a nonpersistent gas. This distance for the highly persistent gases like mustard will vary from 200 yards down wind in the case of a single large capacity shell to 1,000 or more yards in the case of a large concentration projected over a wide front.

d. Types of attacks.—The enemy may employ the following types of chemical attacks:

(1) A short concentration on heavily occupied areas with nonpersistent gas for the purpose of inflicting casualties by surprise.

(2) Harassing fire at a slow rate with shell containing highly or moderately persistent chemical agents, such as lacrimatory or vesicant agents.

(3) Neutralization with highly persistent gas to render areas untenable and to inflict casualties upon personnel occupying them. Mustard gas is the type generally used for this purpose.

(4) Smoke screens to blanket observation, prevent aimed fire, screen troop movements, and inflict casualties.

(5) With incendiaries to set fire to stores, structures, and vegetation.

e. Detection of chemical shell.—A chemical shell containing a liquid can ordinarily be distinguished from other shell by the peculiar intermittent whirring noise it makes in flight and by its low detonation.

f. Protective measures.—In the case of a lung irritant gas, like phosgene, the proper measures are to stop breathing until the gas mask is correctly adjusted and to continue wearing the mask until the gas concentration has dissipated. This time will normally be about 10 minutes. For the vesicant gases, the protective measures include not only the prompt adjustment of the mask but also the proper wearing of protective clothing. If clothing and equipment become contaminated, they also include the prompt removal of such articles, the thorough cleansing of

the body with soap and water, and the decontamination of the infected articles before they are again used. A portion of the liquid agent will remain in the area of burst for several days and during such time it will be dangerous for any person to enter this area unless completely protected with protective clothing.

10. **Chemical projector shell attacks.**—*a.* By means of chemical projectors, a large amount of gas can suddenly be set free. The cloud produced is of higher concentration than can be obtained in the field with any other chemical projectile.

b. The projector is a simple mortar designed to fire only one shot per installation. The projectors are usually installed in batteries of 25 which are fired simultaneously by an electric current. (See fig. 2.) Usually, many batteries are fired at one time against one target.

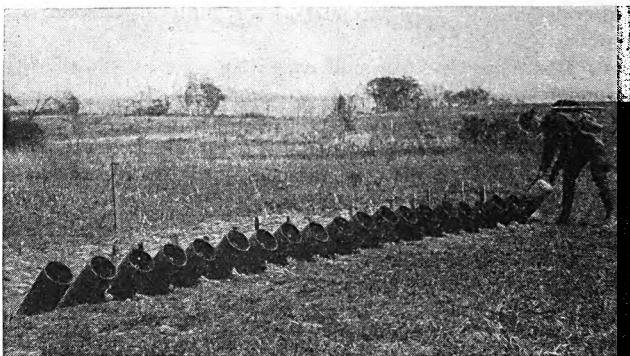


FIGURE 2.—Installed Livens projector battery.

c. Nonpersistent casualty agents are usually employed in these shells. However, highly persistent agents may be projected, especially when the enemy is on the defensive. An enemy may launch a projector attack in two salvos, the first being HE to produce casualties among men above ground and cause momentary confusion, and the second being a nonpersistent gas to reach men below ground and to produce additional casualties during the confusion caused by the first salvo.

d. The agent most likely to be used in Livens projector shell is phosgene. The explosive charge in these shell is only slightly

greater than that necessary to rupture the shell body. The agent from a single shell is thrown over an area about 20 yards in diameter. The shell from a single battery or a group of batteries concentrated on a single point will scatter over an area about 320 yards in depth and 240 yards in width. The gas cloud will completely cover this area in 30 seconds. The prompt adjustment of the gas mask and the wearing of it until the gas moves out of the area fulfill the requirements for protection. The danger area also extends down wind in much the same way as explained in the case of nonpersistent agents projected by artillery or mortar shell. The danger area usually extends several thousand yards down wind from the impact zone.

e. Indications of the installation of projectors by an enemy may be obtained from airplane photographs. It should be noted, however, that projectors can be installed and fired in one night. A projector attack can generally be recognized by a huge flash or a series of flashes immediately followed by a loud explosion. These shells make a peculiar whirring sound in flight and a subdued explosion when they burst.

f. If fired in daylight, Livens projector shell can be seen in the air. This projectile is usually fitted with a fuze burning about 20 seconds; if the loud explosion of the propelling charge is promptly recognized as a Livens projector attack, there is a period of about one-third of a minute in which to give the alarm and adjust gas masks before the gas begins to spread over the target area.

11. Attacks from aircraft; chemical bombs or spray.—Aerial bombs may contain gases of varying persistency as well as smoke and incendiaries. Agents directly sprayed from aircraft are persistent gas or smoke. When flying at low altitudes, airplanes have the ability to launch surprise attacks on unsuspecting personnel. Smoke-laying airplanes can establish smoke screens permitting other aircraft equipped with bombs or spray apparatus containing chemical agents to reach their targets unobserved and protected against hostile fire.

a. *Chemical bombs.*—(1) The agents most likely to be projected by small bombs are mustard and white phosphorus. The explosion of the bomb upon impact throws the agent over an area approximately 20 yards in diameter. The danger from chemical bombs of this size approximates that described in paragraph 9c for chemical shell.

(2) Aerial bombs of 100 pounds or larger may be used to discharge either persistent or nonpersistent gases. The action of agents thus released is similar in principle to the action of agents discharged from projector shell (par. 10) and necessitates corresponding protective measures.

b. Spray attacks.—(1) The agents most likely to be used for spray attacks are mustard, lewisite, and any type of liquid smoke. Attack aircraft flying between 50 and 1,000 feet can lay a belt of persistent gas approximately 1 mile long, the width of the belt varying with the direction and velocity of the wind and the altitude of the plane. A plane flying at 100 feet elevation with a cross wind of 10 miles per hour can gas an area 1 mile long by 100 yards wide.

(2) The requirements for protection from a spray attack with vesicant agents include not only the prompt adjustment and wearing of the gas mask during the attack but also complete protection of the body from the falling spray. This may be obtained by getting out of the path of the spray, by seeking cover therefrom, or by the wearing of protective clothing to exclude the agent from direct contact with the body.

(3) After the attack it will be dangerous to occupy or cross the contaminated belt for a period varying from 10 hours to several days, depending upon the temperature and the quantity of liquid released. During this effective period any person remaining in the area, or crossing it, is likely to become a casualty unless he wears a gas mask and complete protective clothing.

12. Cloud attacks from chemical cylinders or candles.—*a.* Cloud attacks are dependent upon suitable wind direction. The characteristic features of a cloud attack are pervasiveness and duration. The liberated gas may affect an area extending several miles down wind, it being carried along the surface of the ground by the wind.

b. Gas clouds may be released from concealed cylinders or candles or from cylinders mounted on special vehicles.

c. The discharge may be made either by day or night. At the moment of discharge some warning may be given by the hissing of the gas escaping from the cylinders. The cloud is normally white from condensed water vapor, but the actual location and width of the front may be disguised by the liberation of smoke. Only nonpersistent gas is used in cloud gas attacks, but this

may remain for an hour in thick woods or even longer in dug-outs or shelters. The gas most likely to be released from this weapon is phosgene.

13. Bulk chemical agents and chemical land mines.—a. Chemical land mines, fired statically, may be effectively employed by the enemy in withdrawals and retreats for contaminating areas around destroyed bridges, fords, roads, trails, and in front of defensive positions. Persistent gas may also be liberated from containers carried by tanks, or other vehicles, for the purpose of contaminating roads and communications and thus hindering the advance. Chemical agents, thus employed, can be detected only by odor and visible splashes.

b. The gas most likely to be released from this device is mustard. Upon explosion of a single mine the agent is thrown over an area approximately 20 yards in diameter. Areas contaminated by land mines should be avoided, if possible, or else passed on the up-wind side. If it is necessary to penetrate the area, it should either be decontaminated as described in paragraph 25, or lanes cut through as described in paragraph 54*d*.

14. Chemical grenades.—Hand grenades filled with irritant gases are used to force personnel to evacuate dugouts and enclosed spaces. Phosphorus is also used in grenades, particularly as a casualty agent. Hand grenades can be thrown approximately 35 yards and rifle grenades 250 yards.

15. Employment of smoke in chemical attacks.—Smoke is sometimes used, along with gas, in order to deceive an opponent as to the location and extent of the gas. At times, also, small amounts of tear gas may be released in a smoke cloud in order to force masking.

16. General effects of weather and terrain on chemical attacks.—a. Wind.—(1) The effective use of chemical agents is largely dependent on favorable weather conditions. Chemical agents are most effective in light winds; strong winds will rapidly dissipate them. Nonpersistent chemical agents are comparatively ineffective in a wind of over 12 miles per hour. Chemical agents of the highly persistent type are not affected to the same extent by strong wind.

(2) When the enemy releases a chemical agent for a cloud attack within his own lines, the wind direction must be from

the enemy to our lines. The enemy may fire chemical shell, however, on targets within our lines when the wind is in any direction. If the wind is blowing toward his own lines, the quantity of agent used will probably be small and the target area will probably be at considerable distance from his own troops.

(3) When the enemy uses a large amount of mustard gas, it may be anticipated that the gas will be directed far enough rearward in the area attacked to prevent any of the vapor drifting back over his front-line troops. For this reason, when an enemy attacks, our troops in reserve are more likely to encounter the mustard type of agent than those in the forward areas.

b. Temperature.—(1) On warm sunny days, when the temperature of the earth is higher than that of the air, ascending air currents carry the gas upward and disperse it. Warm weather increases the rate of evaporation thereby reducing the persistency of the agent. Cold weather accompanied by clouds increases the persistency of agents.

(2) Substances like mustard gas may freeze in the soil. When mustard gas freezes, it is much less effective. However, the vaporization is still sufficient, except in subzero weather, to produce casualties if personnel are exposed for a considerable period. It must be kept in mind that solid particles of frozen mustard gas may become attached to clothing while passing through undergrowth and these particles will cause burns if they come in contact with the body.

c. Fog and rain.—Foggy and cloudy weather is favorable for the use of gas. Rainfall tends to wash gas out of the air and in most cases slowly destroys liquid on the ground.

d. Night.—The most favorable conditions for the use of gases, particularly those of the phosgene type, occur at night or in the early morning, because strong winds and ascending currents are then usually absent. Furthermore, there is the possibility of effecting surprise on sleeping men.

e. Ground.—(1) *The surface.*—The most important effects of the ground on chemical agents in liquid form are as follows:

(a) *Soft dry ground* will absorb liquids and so reduce the danger from direct physical contact. It is difficult to detect vesicant gas, however, when absorbed in earth.

(b) On *soft wet ground* gas may persist for considerable periods as free and unabsorbed liquid. Where shells or bombs burst on soft ground, a large proportion of the liquid content will be absorbed or buried in the crater, contaminating earth or mud. When boots or shoes become contaminated with liquid mustard gas and are later worn in inclosed places such as a billet or dugout, dangerous vapor concentrations can arise.

(c) On *hard ground* the liquid contents of chemical projectiles are scattered over a relatively large area. Hard ground retards penetration of liquid agents released in this manner; consequently, the agents are exposed in greater degree to the influence of wind, sun, and rain, thus lessening their persistency yet increasing the gas hazard.

(2) *Topographical features.*—All chemical agents successfully used in warfare are heavier than air. Unless set in motion by wind or air currents, gas clouds tend to flow into gullies and valleys, leaving the tops of hills comparatively free.

(3) *Vegetation and obstructions.*—Tall grass, bushes, trees, buildings, etc., retard the movement of the air and in like manner the movement of vapors of chemical agents, thereby making them more persistent. Tall grass and undergrowth increase the danger from vesicants.

17. Conditions favorable for chemical attacks.—*a. Situations in which an enemy may use nonpersistent gas.*—(1) Between midnight and sunup, when ground temperature is lower than air temperature and troops are least alert.

(2) When wind velocities are between 3 and 12 miles per hour.

(3) When wind direction is either from the enemy or parallel to the front.

(4) On troops, particularly large concentrations, located in low ground or in woods.

(5) On foggy, overcast days.

b. Situations in which an enemy may use persistent gas.—

(1) Against strong points and centers of resistance which would be very difficult for the enemy to capture by assault and which he does not expect to occupy or pass through.

(2) In defiles.

(3) On terrain surrounding approaches to fords, bridges, and on beaches.

(4) On artillery firing positions.

(5) On distributing points, airdromes, bivouac areas, rail-heads, marching troops, and supply columns, especially by spraying from attack aviation.

(6) On a withdrawal by the enemy, he may be expected to leave bands of persistent vesicants in front of or within his former position and on routes that are likely to be used by pursuing forces.

(7) On important routes of approach.

c. Situations in which an enemy may use incendiaries.—

(1) Against villages of largely frame construction.

(2) Against army depots, airdromes, and large supply centers well to the rear where inflammable supplies, such as ammunition and forage, are stored in large quantities.

(3) Against positions located in dry grain fields or woods, when the wind direction is from the enemy.

SECTION IV

PROTECTION AND PROTECTIVE EQUIPMENT

18. Classification of protective measures.—Protection against gas attacks presents three classes of problems; individual, collective, and tactical. The first two involve protective measures of a generally passive nature; that is, principally the provision and use of protective equipment and installations. The third concerns modes of action and troop leading, with a view to avoiding gas casualties in the conduct of military operations. These three forms of protection may be briefly outlined as follows:

a. Individual protection.—Individual protection includes not only the proper distribution, use, and care of protective equipment but also ability to recognize the presence of a particular chemical agent; and, by knowing its characteristics, to utilize equipment in such a manner as to avoid becoming a casualty.

b. Collective protection.—Collective protection is the utilization of measures and unit protective equipment for the protection of personnel, animals, and matériel. It includes the posting of gas sentries, operation of gas-proof shelters, measures to insure the preservation of animals and equipment, and the use and decontamination of protective covers.

c. Tactical protection.—Tactical protection is concerned with the disposition of troops in combat and the security measures taken to avoid or greatly reduce the number and severity of gas casualties, and to minimize the chances of contamination of supplies and equipment.

19. Basis of issue of protective equipment.—Items of equipment for defense against gas attacks are issued in conformity with Tables of Basic Allowances.

20. Army gas mask.—*a. Description and use.*—The gas mask protects the soldier's eyes and respiratory tract from chemical agents encountered in the field. Its principal parts are the facepiece, hose, and canister. When carried but not in use, the gas mask is kept in a carrier slung on the left side of the body. The canister remains in the carrier when the mask is in use.

b. Principle of operation.—The principle of operation of the gas mask, which is based on air filtration, is illustrated in figure 3. Air is drawn into the mask when the soldier inhales, the mask being so constructed that this air must first pass through a canister containing a filtration system. This comprises a mechanical filter to prevent the entrance of smoke or dust, and a filler of charcoal and soda lime to absorb and neutralize toxic and irritating gases and vapors. This air, after being purified by filtration, is drawn to the soldier's face and, after being inhaled and exhaled, is expelled from the mask.

c. Types.—Two types of gas masks are issued, both of which operate as described in *b* above.

(1) The *service gas mask* as issued will give full protection against lung irritants, sternutators, and lacrimators in concentrations likely to be encountered in the field. It will *not* protect against carbon monoxide or ammonia gas, and is, therefore, not suitable for a fireman's mask or for use in case of industrial accidents where ammonia gas is present. Antidim compound is included in the carrier which, if applied in a very thin film to both sides of the eye lenses, will assist in preventing fogging from moisture in the mask and from rain. (See fig. 4 ①.)

(2) The *diaphragm gas mask* is issued to officers, noncommissioned officers, telephone operators, and others whose duties require audible speech. This mask is similar to the service gas mask except that a diaphragm is placed in the facepiece just beneath the eyepieces to facilitate voice transmission. (See fig. 4 ②.)

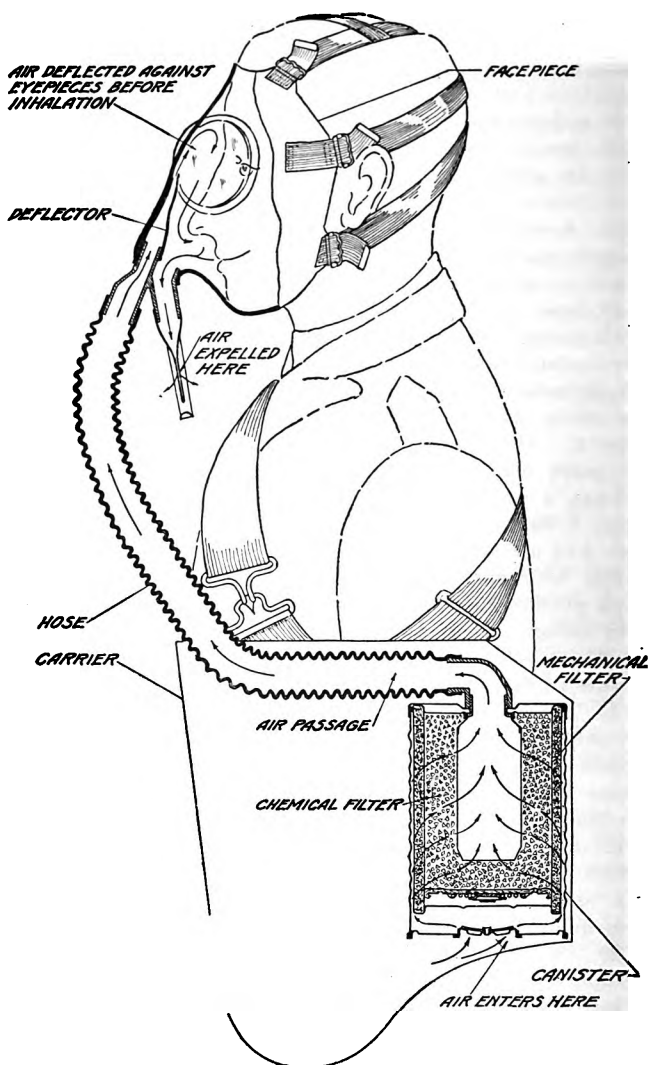
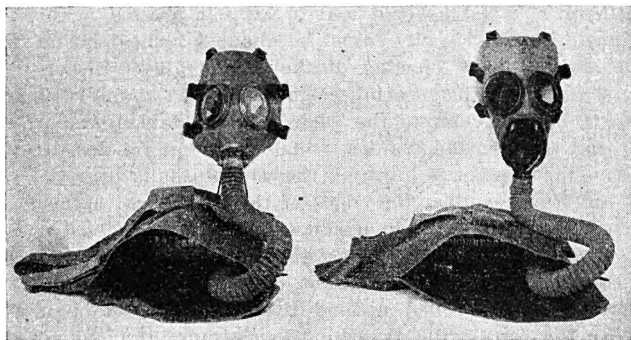


FIGURE 3.—Service gas mask showing passage of air.

21. Protective clothing.—Protective clothing, which is designed for the protection of the body against gases of the mustard type, will be issued in time of war.

22. Gas-proof shelters.—It is possible to subject extensive areas to lethal concentrations of toxic gas for periods varying from a few minutes to several days. Masks and protective clothing are sufficient protection against such concentrations but cannot be used indefinitely. Troops that must remain in gassed areas require gas-proof shelters in which to rest, eat, and sleep, as well as for dressing stations, telephone stations, observation posts, command posts, and for other activities where efficiency is unduly impaired by wearing a gas mask.



① Service.

② Diaphragm.

FIGURE 4.—Gas mask issued to the Army.

a. Location.—Gas-proof shelters should be so located as to take advantage of any natural protection from direct wind paths. Terrain has great effect upon the movement of a gas cloud, especially in a wind of low velocity. High hills and deep valleys deflect gas from the general direction of the wind. Whenever possible, shelters should be located where heavy concentrations of gas will not form.

b. Principles of construction.—The important consideration in making a gas-proof shelter is the elimination of all drafts. A special type of entrance is used which consists of a system of double doors of hung blankets which, when dropped, lie on

slanting frames, the outer slanting outward and the inner slanting inward. Whenever possible, the entrance to a gas-proof shelter should be a walled-in passageway or tunnel several feet beyond the walls of the shelter both inside and outside, with the ends slanted so as to receive the door frames at the proper angle. The door frame is made preferably from 1 by 6 inch boards at the sides and by 1 by 4 inch boards at the top and bottom. (See fig. 5.)

c. Construction of blanket doors.—Blanket doors are constructed by cutting a blanket to the proper size (about 4 inches wider and longer than the door frame) and attaching the top end to the door frame. Slats are nailed horizontally at intervals across the inside and outside of the blanket to hold it in place when lowered and to keep it pressed against the frame. The inside slats must be about 2 inches shorter than the width of the opening of the door frame. Either nails, nuts, bolts, or other special weights are used at intervals from top to bottom close to the edges of the blanket and outside of that part of the blanket which falls on the door frames. When the blanket is lowered, the weights hang over the edge of the frame, pulling the edges of the blanket with them, and thus forming a flap which keeps the blanket pressed against the frame and aids in making the door airtight.

(1) *Shelf for door when left open.*—When not in use the blanket door is rolled up and the roll is placed on a shelf above the top of the frame. If necessary, a metal cover is nailed over the shelf to protect the blanket from sun and rain.

(2) *Functioning of double-door system.*—When lowered into place, the two doors make the shelter gas-proof by forming an air lock between them. To enter the outer door, one side of the blanket on the leeward side is pulled away from the frame just far enough to permit entrance; the person then enters the air lock and closes the outer door behind him before opening the inner door. When leaving the shelter, the reverse procedure is followed.

(3) *Proper distance between gas-proof doors.*—When the entrance to the shelter is a simple horizontal passage, the doors are placed at an average distance of 6 to 9 feet apart. If the entrance is a stairway, one door is placed at the head

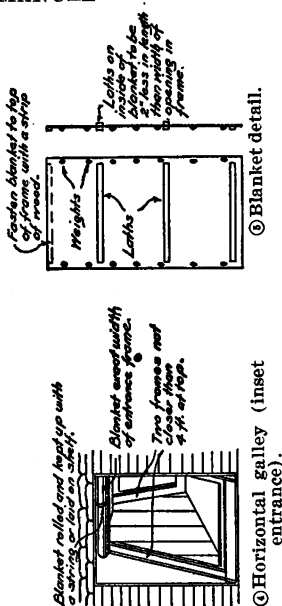
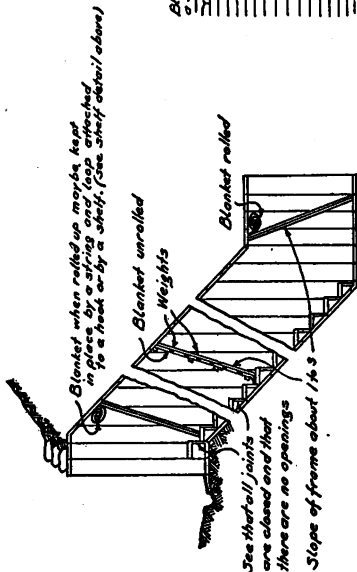
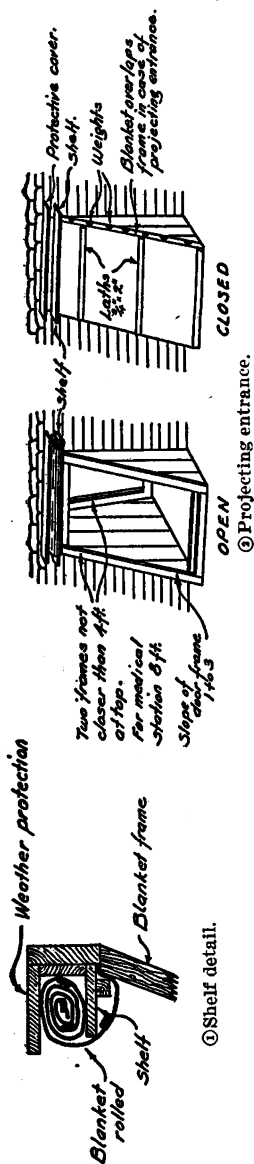


FIGURE 5.—Typical arrangement for gas-proofing dugouts.

of the stairway and the other at the foot, where there is a horizontal passageway for a few feet. If the stairway enters directly into the room, the two doors are placed at intervals on the stairway with both slanting outward. In case of a dressing room, the space between the doors must permit stretcher bearers to bring in a stretcher without opening both doors at once.

(4) *Modifications in construction.*—Where the entrance is not a projecting passageway as described in (3) above, modifications in the construction of the blanket doors must be made. In any case, the same principles should be observed.

(5) *Preparation for use.*—Lower both blanket doors, close all ventilators and put out all fires. Fires use up the oxygen, draw in air from outside, and give off that odorless poison gas, carbon monoxide. See that a supply of chloride of lime is in the shelter. Spread it around between the doors at the start of a gas attack. This will neutralize any liquid agent which might adhere to the shoes of men coming from contaminated areas.

d. *Ventilation.*—Persons entering a shelter during a gas attack will always bring in on their shoes and clothing traces of gas. This is especially dangerous in the case of mustard, as an effective concentration entirely imperceptible to the occupants may gradually be built up. In dugouts or shelters intended to be used for a considerable time, collective protectors (par. 23) should be obtained from the chemical officer and installed. After a gas attack a contaminated shelter may be cleared of gas by opening the doors and building a fire within. The length of time that a gas-proof shelter may be occupied without ventilation may be estimated by applying the rule that a man requires 1 cubic foot of air per minute; more is desirable.

23. Collective protector.—a. This item of equipment is issued for use at gas-proof command posts, plotting rooms, and aid stations, which are intended to be used for a considerable time and where air may, in a short time, become foul or deficient in oxygen during a gas attack. It consists of an air blower mounted on a large canister and several feet of rubber pipe. The collective protector should only be used in an inclosure that has been made reasonably airtight. When an

old building is being used, the windows and large cracks should be chinked with mud, rags, paper, or any suitable material available. Large openings such as shell holes can be closed with gas-proof blankets.

b. The collective protector is set up outside of the room or inclosure to be protected and the pipe run inside. The concentration of gas is invariably greater near the ground level; consequently, the air intake should be as high as is practicable to place it.

c. When a gas attack starts, the collective protector is set in operation. Air from the outside is pumped through the canister, purified, and blown into the inclosure. A positive pressure of pure air is thus built up in the protected space which prevents the entrance of gas.

24. Gas alarms.—*a.* These items of equipment are issued to organizations. The standard type is the alarm horn which gives a distinctive sound not easily confused with other sounds encountered in action. Empty shell cases or sections of iron rail may be used as improvised alarms when standard alarm horns are not available.

b. There are two classes of alarms given when an enemy gas attack occurs—general alarms and local alarms. General alarms are given only in the case of cloud gas attacks that are expected to involve a large area. Local alarms are given in all cases in which the presence of gas is recognized. A general alarm is sent out by all normal methods of communication and is directed to all localities that may be affected. Local alarms are usually given with alarm horns.

25. Decontamination.—*a. Protection of degassing details.*—Men detailed for decontaminating work should wear gas masks and protective clothing. The entire body must be protected. The work should be performed under a noncommissioned officer. He should be prepared to apply first-aid measures in case of necessity, and should have the necessary solvents, or neutralizing agents, close at hand. The men should be inspected before commencing operations to insure that they are properly protected. Facilities away from other troops should be provided for undressing and bathing after completion of their work. Men should be taught to assist each other in removing the clothes used in decontaminating work without touching them to the

bare skin or contaminating the clothing beneath. Facilities for disposal or cleaning of contaminated clothing should be provided. As decontaminating operations are local in character, their success will depend largely upon the equipment and facilities available.

b. Limitations.—Chemical agents may be destroyed or neutralized by other chemicals. No one chemical, however, is effective in all cases. Moreover, it is not practicable for an army to carry either a great variety or quantity of chemicals. Hence, decontaminating operations are necessarily limited. Whether they are practicable at all will depend upon the character of the chemical agent involved, the extent of the contamination, and the importance of the contaminated area or equipment.

c. Marking contaminated areas.—When it is not practicable thoroughly to decontaminate an area, it should be marked with danger signs showing the agent involved and the date of contamination or its discovery. Generally, sentries should be posted to warn unauthorized persons from entering such areas.

d. When to decontaminate.—Decontamination work should be commenced immediately after the shelling or as soon thereafter as possible. It should be understood that when the shelling takes place at night or at other times when the temperature is relatively low, little vapor may be given off, while later, in the warmth of the sun, a high concentration may result. Areas treated during cool periods of the day should be inspected after the temperature has risen to determine whether further treatment is required.

e. Materials.—Decontaminating materials are issued in time of war to destroy or neutralize highly persistent agents of the mustard-gas type. Small areas, buildings, and equipment which have become contaminated can, within certain limits, be decontaminated. The following materials may be used for decontamination work:

(1) *Earth.*—Earth, sand, ashes, or sawdust may be spread over a contaminated area to give temporary protection. The covering layer should be at least 3 inches thick. This does not destroy the chemical agent but forms a seal preventing for a limited time the escape of toxic vapor. Such covering will be more effective if wet down with water.

(2) *Water.*—(a) Lewisite is readily decomposed by water, therefore liberal wetting of areas so contaminated is sufficient to

destroy this agent. The reaction product of lewisite and water is a vesicant solid substance; while it gives off little vapor, the solid causes severe burns on contact with the body. Consequently, even long after decontamination of a lewisite area, it is dangerous to sit or lie down in the area. After treatment with water, a lewisite area should, if practicable, be covered with a layer of earth, sand, or ashes.

(b) Mustard gas is very slowly hydrolyzed by water. The reaction product is nonvesicant. The action of cold water on mustard is so slow that it is practically negligible for decontaminating purposes. Hot water is more effective. However, where there is sufficient drainage, mustard gas will be washed away by water. As it is heavier than water, it will lie at the bottom of pools and puddles, remaining active for a long period of time, though the water over it will retard the escape of mustard vapor.

(3) *Bleaching powder (chloride of lime).*—(a) This material is a white powder, not very stable, readily giving up its chlorine when exposed to the air or moisture. Consequently, it should be kept in airtight containers and used as soon as possible after removal therefrom. Bleaching powder reacts quickly with mustard gas, forming a nonvesicant compound. In contact with liquid mustard it reacts violently not only causing flame but driving off a high concentration of mustard vapor. If the bleaching powder is mixed with sand or earth, this violent reaction does not occur. The proportion should be about 1 part of bleaching powder to 3 parts of sand. Four to five pounds of this mixture are required per square yard of gassed area.

(b) In the decontamination of equipment, bleaching powder can frequently be more easily and efficiently applied in liquid form with rags or swabs. When used as a liquid solution, the proportion should be about 1 part of bleaching powder to 1 part of water.

(4) *Sodium sulphide.*—This chemical is used in a one percent aqueous solution. It reacts more slowly than bleaching powder but, since no heat is evolved in the process, mustard vapor is not driven off. The solution is more effective if heated before use. It may be used either as a spray or mixed with sand. In the latter case 1 part (by weight) of the liquid is used with 4 parts of sand and the mixture spread by shovels

over the gassed area. Six gallons of sodium sulphide are needed for each square yard of area to be degassed.

(5) *Green solution*.—This solution which has a greenish color is prepared by dissolving 1 pound of bicarbonate of soda (baking soda) in 1 gallon of commercial hypochlorite solution. This mixture is less efficient for destruction of mustard gas than bleaching powder but is also less corrosive to metals, hence is applicable for decontaminating metal equipment. It should be generously used with sponge or rag until surface is cleaned.

f. Methods of decontaminating.—(1) *Shell holes*.—(a) In decontaminating a shell hole, not only the shell crater but the entire area of contamination about the point of burst should be treated. A 75-mm mustard gas artillery shell produces a crater roughly 2 yards in diameter; however, the diameter of the area sufficiently contaminated with liquid agent to require decontamination is approximately three times as large. With a 155-mm shell the area is approximately 15 yards in diameter and with the 4.2-inch chemical mortar shell it is approximately 12 yards in diameter. These areas do not center exactly on the shell hole but generally extend somewhat in the line of fire.

(b) The contamination is generally greatest in the shell hole itself. Pools of liquid mustard gas or large visible splashes on ground or vegetation are rarely found. In most cases mustard is only perceptible by its odor. The area outside the crater is usually much more lightly contaminated. If this area includes high grass or brush which cannot be decontaminated as it stands, it should be cut down so that it can be treated and disposed of. As a rule 1 pound of bleaching powder for each square yard of contaminated ground is the minimum requirement.

(c) Sodium sulphide or green solution may be sprayed over a contaminated shell hole or first mixed with sand and spread with a shovel. Bleaching powder, however, is more effective for this purpose.

(2) *Grass land*.—An area covered with high dry grass or brush may be decontaminated by burning, provided this can be done without danger to nearby personnel. The heat will cause a heavy cloud of mustard vapor to be given off down wind during the burning. If burning is not feasible, bleaching powder mixed with water may be sprayed on small areas.

(3) *Weapons and metal equipment.*—Greasy or oily metal surfaces contaminated with mustard gas should first be cleaned with kerosene or gasoline. These solvents do not destroy mustard, but dissolve it so that most of it may be removed. Rags used for the purpose should be burned in a fire with a good draft, as they will be grossly contaminated. After such treatment, a very thin coating of mustard will still remain on the surface of the metal so that it will still be dangerous to touch. This is difficult to remove and must be treated with neutralizing chemicals. A solution of bleaching powder mixed with water, hot sodium sulphide, or green solution, are suitable materials to use, the latter two being much less corrosive. To avoid serious corrosion in using bleaching powder mixed with water, the application should not be left on for more than an hour at most. After such treatment the surface should then be washed, dried, polished, and oiled.

(4) *Clothing and fabric equipment.*—(a) *Airing.*—Clothing contaminated by mustard vapor only may be decontaminated by hanging up the garments so that they will be exposed to the sun and wind. In warm bright weather 2 days airing generally will be sufficient. Care should be taken not to hang garments close together, especially not on top of each other. In cool cloudy weather, this method should not be relied upon.

(b) *Steaming.*—A more positive method of destroying mustard gas in clothing is to subject it to steam. If contaminated with mustard vapor only, clothing may be decontaminated by 2 hours of steaming. If splashed with liquid mustard, steaming should be continued from 4 to 6 hours. Various kinds of steam disinfectors can be improvised from materials available in the field. The simplest is merely a large G. I. can provided with a false bottom which serves to hold the clothing about a foot from the true bottom. Six or eight inches of water is poured into the bottom of the can, the false bottom inserted, and the garments piled in. The can is then placed over a fire, the top being covered but not so tightly as to prevent the escape of the steam. The capacity of such a disinfecter can be increased by hanging additional clothing in an inverted canvas bag suspended over the can, the open end of the bag being tied about the sides of the can.

(5) *Shoes.*—Little can be done in the field to decontaminate shoes permeated with mustard. If only lightly splashed and before the mustard has soaked into the leather, shoes may be neutralized by applying bleaching powder or bleaching powder mixed with water. As a safety precaution it is well for men exposed to mustard gas to shuffle their feet from time to time through a mixture of bleaching powder and dry earth or sand. Well-worn shoe leather absorbs mustard much quicker than new leather.

(6) *Animals and animal equipment.*—(a) Lead the animals from the gassed area and remove contaminated equipment. If liquid agent can be seen on the animal's legs or bodies, it should be removed with dry rags or cotton. Do not rub the area. Wash the affected parts with soap and water. Riding the animals through a stream is a help when affected parts are on legs and belly. All animals should be washed if they have been near an area contaminated with a vesicant chemical.

(b) Leather, unless specially treated, absorbs mustard almost instantly. Hence, equipment such as saddles and harness should be treated with a hot solution of bleaching powder and water immediately after being sprayed or splashed with this agent.

(7) *Buildings.*—In general, if liquid agents have been carried into buildings by shell fire, the buildings should be abandoned for military use in the field. If a building which has not been gas-proofed has been subjected to vapors from vesicant agents, the ceilings and walls should be sponged or washed with a mixture of bleaching powder and hot water and the wooden floors should receive a thorough scrubbing with the same material.

26. *Horse mask.*—The horse mask is a device to protect the respiratory tracts of horses and mules from lung irritants. This device is a bag made of cheesecloth and treated with chemicals to neutralize the gas that passes through it. Horses and mules never breathe through the mouth; hence, this bag is put over the upper jaw and nostrils only. The eyes of horses and mules are not susceptible to lachrimation, therefore do not require protection. When not in use, the mask is carried in a carrier secured under the horse's lower jaw.

27. Protection of food supplies.—a. Protective covers.—Tarpaulins and vehicle covers made impervious to the persistent gases will be issued in time of war to protect transportation, equipment, and supplies.

b. Food protection at the front.—(1) Rations and forage issued to troops at the front should, insofar as practicable, be kept in airtight containers until required for use.

(2) In stabilized situations, and otherwise as circumstances may permit, gas-proof shelters should be used for storage of food supplies in the field.

(3) Cooked rations sent up to troops should be kept in closely covered containers until issued. Ration carts and rolling kitchens should be covered with paulins for protection against chemical spray. Tent flies or some such overhead covers should invariably be provided for field kitchens. In case canned goods are sprayed with chemicals, the cans should be decontaminated by boiling before they are opened.

(4) Food not protected by containers, which has been contaminated with chemical agents, is normally discarded. In case there is a shortage of food, special instructions from a medical officer will govern as to its decontamination.

c. Purification of water.—(1) Mustard gas is only slightly soluble in water and, being heavier, sinks to the bottom. Insofar as possible, water contaminated with mustard should be avoided. In an emergency, however, such water may be rendered safe for use by settling, chlorination, and boiling. After being allowed to stand for not less than 4 hours, the top portion is siphoned off, leaving a layer of 10 to 12 inches which should be discarded. Bleaching powder in the proportion of one-fifth of a pound to 1 gallon of water should then be added and the water boiled for at least 1 hour. Water so treated should not be used until it has been tested by a medical officer.

(2) Water contaminated by arsenical agents such as lewisite and adamsite, or by white phosphorus, cannot be purified by boiling.

28. Protection of supplies, equipment, and munitions.—a. Weapons.—(1) Field pieces, machine guns, rifles, and other steel weapons may actually be rendered useless by long exposure to the corrosive action of certain chemical agents.

Unpainted working parts are especially vulnerable and as a general precaution should be kept well coated with oil or grease. Weapons should invariably be inspected following gas attacks and, as soon thereafter as practicable, cleaned and reoiled. Gasoline will remove the old lubricant; water and soap, washing soda, or green solution should be used to clean the affected parts before new lubricant is applied.

(2) If sprayed with mustard gas, weapons must be decontaminated before it will be safe to handle them. Bleaching powder mixed with water should be used on the wheels, trail, and outside of barrel of field pieces, but its use on breech locks, traversing screws, and other working parts of such weapons should be avoided because of its corrosive effect. Such parts should be treated as instruments, using alcohol or gasoline, hot water and soap, or such other noncorrosive material as may be provided to remove the mustard. Wooden gunstocks contaminated with mustard should be treated repeatedly.

b. Ammunition.—Since brass shell and cartridge cases are particularly susceptible to corrosion by gases like phosgene, ammunition should be kept in sealed containers. If ammunition becomes badly corroded, it may be necessary to discard it or to clean it thoroughly before it is used.

c. Instruments.—Instruments such as those used in fire control should be kept in their containers except when in actual use. If exposed to corrosive gases, they should be cleaned with alcohol (or gasoline, if alcohol is not available) at the earliest opportunity, after which their moving parts should be given a thin coating of light machine oil.

d. Airplanes.—Vesicant spray attacks against airdromes are likely. Where it is not feasible to place airplanes in hangars, gas-proof covers, at least for cockpits and machine guns, will be provided for placing over these parts when airplanes are not in use. Mustard sprayed on wings and fuselage of an airplane may do little if any harm; but if seats, instrument board, control, and firing apparatus are sprayed, pilots and observers later using the airplane may become casualties. Moreover, the decontamination of such parts will be extremely difficult. If an airplane becomes contaminated with a vesicant agent, it should be taken as soon as practicable to an airdrome where it can be

properly decontaminated. Bleaching powder, hot water, and soap are used for this purpose.

e. Vehicles.—Drivers of vehicles which have been contaminated should be careful not to come in contact with contaminated parts in getting on or off a wagon or truck. Seat cushions which have been sprayed should be discarded. Washing thoroughly with water and using bleaching powder on badly contaminated spots is all that can be done in the field in decontaminating vehicles. Contaminated harness should be carefully cleaned before use.

f. Inflammable supplies and equipment.—Inflammable supplies and equipment should be piled in small stacks far enough apart to prevent one stack from catching fire from another in case the enemy uses incendiary agents.

SECTION V

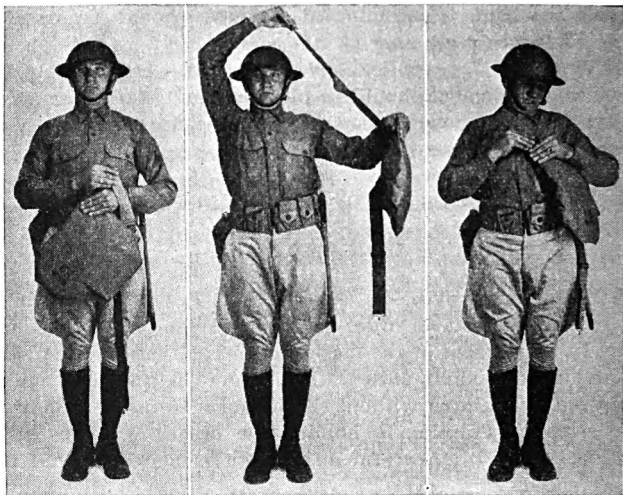
THE GAS MASK

29. Gas mask drill.—*a. General.*—(1) Preliminary drills will be by the numbers in order to acquire completeness and accuracy in adjustment of the mask and to habituate the individual in its correct manipulation. Proficiency in this drill will be followed by training without the numbers to insure rapidity of adjustment. Training in holding the breath will also be included. As a rule, careful adjustment is more essential than great speed.

(2) Holding the breath applies only to drill without the numbers. Its importance should be emphasized and men should be taught to hold their breath immediately upon detecting gas, or upon hearing the gas alarm or the command *Gas*.

b. Commands.—(1) *To sling the mask.*—By the numbers. 1. *Sling*, 2. *MASK*. At the command *Mask*, grasp with the left hand the metal eye which is near the flap of the carrier above the two snap fasteners, at the same time grasping the shoulder sling close to the carrier with the right hand palm up and run the hand out to the extremity of the shoulder sling, thus straightening out kinks. Hold the carrier waist high in front of the body with side containing snap fasteners next to the body. (See fig. 6 ①.)

TWO. Extend the left arm sideways to full length. At the same time pass the shoulder sling behind the head and over the right shoulder with the right hand (fig. 6②), then bring the two hands together across the chest and fasten the hook and eye together (fig. 6③). Adjust the carrier snugly under the left armpit. Pass the waist strap around the waist and fasten together in front.



- ① Position at the command **Mask**.
 ② Passing the shoulder sling behind the head and over the right shoulder at the command **Two**.
 ③ Fastening the hook and eye together.

FIGURE 6.—To sling the mask.

(2) *To adjust the mask.*—(a) *Dismounted.*—The headpiece adjusted with strap under the chin, 1. **By the numbers**, 2. **GAS**. At the command **Gas**, stop breathing. (*Standing*—Place rifle (if unslung) between knees so butt is off the ground; *kneeling*—Place rifle across elevated thigh and next to the body with butt to the right; *prone*—Place the comb of the stock flat under the chest with the muzzle of the rifle pointing to the front. Then turn the upper part of the body to the left so that weight is on right shoulder and gas mask is elevated.)

Place fingers of left hand on chin above the chin strap; with right hand knock off headpiece from behind and catch it on the left arm by the chin strap. With the left hand open and continue to hold open the flap of the carrier and thrust the right hand into the carrier, grasping the facepiece between the thumb and fingers just above the angle tube. Bring facepiece smartly out of the carrier to height of chin, holding it firmly in both hands with the fingers of each extended and joined outside of the facepiece above eyepieces, the thumbs inside of the facepiece under the lower straps of the head harness and as high as possible without distorting the lower edge of the facepiece. Thrust out the chin (fig. 7 ①). (A close-up of facepiece held ready for adjustment to the face is shown in figure 7 ②.)

TWO. Bring the facepiece toward the face, digging the chin into it. With the same motion guide straps of the harness over the head with the thumbs. Feel around the edge to make sure the facepiece is well seated (fig. 7 ③). See that head harness is correctly adjusted.

THREE. Close outlet valve by pinching between thumb and fingers of right hand to prevent passage of air through it, then blow vigorously into the mask, completely emptying the lungs, thus clearing the facepiece of gas (fig. 7 ④).

FOUR. If chin strap is equipped with cheek snap, unfasten it; replace headpiece, adjusting the chin strap under chin and refasten cheek snap. If chin strap is not equipped with cheek snap, replace headpiece, adjusting the chin strap to the back of the head. Pass the flap of the carrier around the hose and fasten on the outer snap fastener. Take the position of *Trail arms* (fig. 7 ⑤).

(b) *Mounted*.—1. *By the numbers*, 2. *GAS*. Stop breathing. Drop the reins behind the pommel of the saddle. Continue as prescribed for the dismounted drill. Having fastened the flap of the carrier around the hose as prescribed, take the reins.

(3) *To test for gas*.—Mask being adjusted, the command is: **TEST FOR GAS**. Dismount, if mounted. Take a moderately full breath. Stoop down so as to bring the face close to the ground but do not kneel, care being taken that the rifle does not touch the ground. Insert two fingers of right hand under

facepiece at right cheek. Pull the facepiece slightly away from right cheek and sniff gently (fig. 8). If gas is detected, readjust the facepiece and resume the erect position. Close outlet valve by pinching between thumb and fingers of right hand and blow out vigorously, thus clearing the facepiece of gas. Release hold on outlet valve.

(4) *To remove the mask.*—By the numbers. 1. **Remove, 2. MASK.** At the command **Mask**, if mounted, drop the reins be-



FIGURE 8.—Position in testing for gas. (Knee or equipment should not touch the ground.)

hind the pommel of the saddle; if dismounted, place rifle, if unslung, between knees so that the butt is off the ground; if chin strap of headpiece is equipped with cheek snap so that chin strap is worn under chin, unfasten it.

TWO. Grasp the headpiece with left hand and remove; at the same time with the thumb and fingers of the right hand grasp facepiece just above angle tube and, with an outward and downward motion, pull the facepiece clear of the chin; pass the face-

piece up and over the head and place over the left elbow; with both hands replace the headpiece and, if equipped with cheek snap, fasten same. The mask is then grasped in the right hand and held at chest height in front of the body.



FIGURE 9.—To replace the mask.
(Position at conclusion of first count of the command *Mask*.)

(5) *To replace the mask.*—By the numbers. 1. *Replace*, 2. *MASK*. At the command *Mask*, retain the facepiece in right hand, palm up, and hold with edges of facepiece turned upward, the fingers under the left eyepiece and thumb under the right eyepiece. With the left hand place head harness pad inside the facepiece just above the eyepieces. With the left hand open flap of carrier. With the right hand bring the facepiece toward the carrier. With the left hand loop the hose tube over the flutter valve guard and through the facepiece, holding the tube in this position with the thumb and fingers of the right hand just below the eyepieces (fig. 9). Place left hand on flap of carrier.

TWO. Push the hose and facepiece into the upper empty part of the carrier, permitting the hose to slide into its proper place in the carrier. With both hands fasten the flap of the carrier on both snap fasteners, the top of the flap on the inner or rear snap fastener. If mounted, take the reins. If dismounted, take position of *trail arms*.

(6) *To unsling the mask.*—1. *Unslung*, 2. *MASK*. At the command *Mask*, unfasten the body straps with both hands and then the shoulder straps with both hands. The mask is re-

tained in the left hand by grasping the metal eye of the carrier just above the flap.

(7) *To prepare for mask inspection.*—The mask being in the slung position, the command is: **PREPARE FOR MASK INSPECTION.** Place rifle (if unslung) between knees so that butt is off the ground. Unslung mask. Open flap of carrier and take out complete mask, including canister. Hold carrier in left hand and canister, with facepiece hanging downward in right hand.

(8) *Mask inspection.*—By the numbers. Being prepared for mask inspection, 1. **Inspect**, 2. **MASK.** At the command **Mask**, free right hand by holding canister under left armpit, the hose and facepiece hanging over left shoulder. Examine the sling and the exterior and interior of the carrier in turn to insure that there are no defective or missing parts; that all parts are securely fastened in place; that the body of the carrier contains an antidim tube and is free from holes, tears, and rips.

TWO. Fasten the hook and eye of the shoulder sling together. Slip the left arm through the sling and allow the carrier to hang from over the left shoulder, at the same time grasp the canister with the right hand and bring in front of body. Examine the canister for rust spots and weak places by pressing lightly with the fingers, beginning at the bottom and working toward the top; see that its contents do not rattle on shaking; see that rain shield is not loose and that the inlet valves are present.

THREE. Adjust the mask to the face. Pinch together the walls of the hose just above the canister nozzle and inhale. If air can be drawn in, a leak is present and its approximate location may be determined by pinching the walls of the hose together at the angle tube. If a leak is no longer detected on inspiration, the leak is in the hose; otherwise, it is elsewhere. This inspection is not conclusive as to the absence of a leak in the hose and such a leak will be determined by the minute inspection indicated below. If the leak is found not to be in the hose, then pinch together the outlet valve at the angle tube and also the hose. If the leak is no longer detected on inspiration, the leak is in the outlet valve below where it was pinched; otherwise it must be above this point or in the facepiece. Having determined the approximate

location of the leak or its absence, next examine the hose for obvious tears, punctures, or other defects. See that it is properly connected to the canister nozzle and to the angle tube and that the adhesive tape over the binding wires is present and in good condition.

FOUR. Remove facepiece and place canister under left armpit. Examine the outlet valve for tears and pinholes by distending the rubber between the fingers. Look especially for pinholes just below where the outlet valve is joined to angle tube and for tears around valve opening. See that valve has no dirt or sand in it and that it is properly connected to the angle tube. See that the binding wire is properly taped. See that outlet valve guard is not loose.

FIVE. Examine outside of facepiece for tears or other damage to stockinette. See that angle tube is properly connected to facepiece with rubber band surrounding the binding. See that the fabric has not torn or pulled loose around the eyepiece frames. Examine the chin seam and see that it is in good condition and properly taped inside and outside. Examine the inside of the facepiece for pinholes. See that the deflector is in good condition, properly connected to the angle tube, and properly cemented to the sides of the facepiece. Test the entire facepiece fabric for softness and pliability.

SIX. Examine the head harness. Make sure that it is complete, that all its parts are properly attached, and are in serviceable condition.

SEVEN. All men with defective masks step forward one pace. Others replace mask in the carrier, taking care to replace canister and facepiece in the proper position.

30. Adjustment and removal of the gas mask before, during, and after a chemical attack.—Gas masks will be adjusted upon detecting the presence of gas, at the alarm of gas, or at the command of an officer or noncommissioned officer. They will be removed during or after a gas attack *only* at the command of an officer or a noncommissioned officer acting in command.

31. Fitting the gas mask.—*a. Facepiece.*—Facepieces which are too large may permit air to enter without passing through the canister. They may also cause the lenses to fall too high or too low with respect to the eyes of the wearer, thus restricting

vision. The lenses should be in such position that the lower third of the upper half of each is directly over the pupil of the eye. Facepieces which are too small are uncomfortable and may also restrict vision. The procedure in fitting facepieces is as follows:

(1) *Estimation of size.*—Estimate the size of the mask to be worn by looking at the contour of the man's face.

(a) Gas masks may be issued in sizes from nos. 1 to 5, inclusive, no. 1 being the smallest. Experience has shown that the percentages of different sizes required by average enlisted men are approximately as follows: Size no. 1, 4 percent; size no. 2, 50 percent; size no. 3, 35 percent; size no. 4, 10 percent; size no. 5, 1 percent.

(b) Universal size gas masks may be issued, in which case they will fit men who normally take sizes nos. 2, 3, and 4, and some of the men who normally take size no. 1. If the universal size gas mask is issued, the percentages of sizes are approximately as follows: No. 1, 4 percent; universal size, 95 percent; no. 5, 1 percent.

(2) *Fitting the facepiece.*—(a) When men are adjusting facepieces for the first time, the straps of the head harness should be loosened to their full extent. The gas masks are then put on and the head harness straps adjusted. The straps should be so adjusted that the head harness pad is well down on the back of the head and the eyepieces are directly over the eyes. The fit of the facepiece to the contour of the face at the temples, cheeks, forehead, and chin should then be examined. The facepiece should fit snugly throughout.

(b) If a snug fit is not obtained, either a different size mask must be used or the head harness straps adjusted. In adjusting the head harness straps it is important to see that the head harness straps on opposite sides of the face are adjusted to the same length. If it is necessary to shorten the head harness straps considerably, the facepiece is too large and the next smaller size should be used. On the other hand, if the facepiece, after the head harness has been properly adjusted, fits too far forward on the face or there is excessive pressure at the outer edge, the mask is too small.

(3) *Suction test.*—The simplest check on the fit of the mask is the suction test, which is as follows: First, adjust the mask;

second, exhale fully; third, pinch the hose and inhale. If the facepiece fits properly, it will cling to the face by vacuum and the wearer will be unable to get air. If the fit appears to be satisfactory as a result of this test, it should then be tested in the gas chamber.

(4) *Testing in gas.*—(a) Before any gas mask is used for protection against a lethal or irritant gas, inspection of the mask will include a man-test in a lacrimatory atmosphere to detect any leaks that may have resulted from improper assemblage or that have developed in storage from age or deterioration of components. A gas chamber is used for this purpose. The gas chamber consists of a room or other inclosure into which a chemical agent may be readily introduced and in which gas masks may be tested on the wearer. An irritant gas is used in a concentration which will cause only momentary discomfort if leaks or improper fits are encountered. The principal purposes which the chamber serves are as follows: First, it is a means of testing the fit and adjustment of the mask by exposure to a tear gas; second, it proves to the individual the fact that his mask really does protect him from gases and tends to dispel the fear of gas.

(b) Any reasonably airtight room or enclosed space of moderate size will serve as a gas chamber. For training in time of emergency, the chamber should have adequate capacity. As a safety precaution, it should be from 100 to 200 yards away from any other place where personnel will likely congregate. It is desirable that the room be well lighted both naturally and artificially. A two-room building with each room approximately 25 feet square, of rough timber, covered with tar paper, with two doors for each room, is large enough for a brigade. With nothing better available, a wall tent may be used. After a tent is used as a gas chamber, it should be turned wrong side out and left in the sun for several days before other use is made of it. Otherwise, subsequent users may be affected by the absorbed gases. The gas chamber is filled with an intolerable concentration of tear gas (chloracetophenone). The contents of a CN capsule or CN crystals (enough to cover a 25-cent piece) are placed on the top of a tin can, in the sides of which holes have been punched, and heated by a lighted candle placed underneath the can until the tear gas is

volatilized. Before entering the gas chamber, the officer in charge puts the men through the gas mask drill and satisfies himself that all men are protected. Men wearing their masks are then sent into the chamber in groups of ten or more. A junior officer or sergeant takes station inside the chamber. The men stay in the chamber about 5 minutes. While there they talk and move around but do not tamper with the mask. On emerging from the gas chamber, the men move a sufficient distance therefrom to make sure that on removal of the mask the eyes will not be affected by fumes leaking from the chamber. They are examined by an officer in charge before they are allowed to take off the mask. He examines the fit of the mask, then orders the masks removed and examines each wearer for signs of laceration. The man is asked whether the mask is comfortable. If the pressure on the man's face shown by the red outline is not well distributed or is extreme, the head harness must be loosened or a larger mask used. When the man has detected gas in the chamber, either the head harness must be tightened or a smaller mask used, in which case the test must be repeated in gas.

b. Adjusting shoulder sling to body.—In adjusting the shoulder sling to the body, the two shoulder sling slides should be so equalized that the stitched-in offset in the center of the shoulder sling will rest on the right shoulder.

c. Adjusting waist strap to body.—In adjusting the waist strap to the body, the strap can be lengthened or shortened by adjustment of the waist strap slide to fit the contour of the body.

d. Slinging of mask when equipment (pack) is to be adjusted.—The gas mask is slung and adjusted first. The pack with belt is slung in the prescribed manner, except the left front suspender is unhooked and passed underneath the gas mask carrier. The left front suspender is then snapped into the proper eyelet of the belt. In removing the pack, the left front suspender is unsnapped and the pack removed in the usual manner.

32. Wearing the gas mask.—*a. In training.*—(1) Personnel should be given confidence in the protection offered by wearing the mask. This can be accomplished by having the individual properly masked enter a gas chamber in which a

strong concentration of an irritant gas has been set up. After remaining in the gas chamber for a few minutes they are ordered to remove the mask and to remain in the chamber until lacrimation begins. Their confidence in the mask is thus built up by a practical demonstration of the protection afforded by it in an actual concentration of gas.

(2) On emerging from the gas chamber, the men should be instructed to face into the wind and blink the eyes to secure quick relief and under no circumstances to rub the eyes with the hands.

(3) Wearing the mask for long periods results in a noticeable reduction in the individual's efficiency. This loss in efficiency can be minimized, however, by practice in wearing the mask during general work. Just as marches fit men and animals to withstand campaign conditions, the wearing of the gas mask strengthens men's diaphragm muscles and reduces the fatigue of the wearer. The practice should be made easy at first and then progressively more difficult from day to day by varying the nature of the work performed as follows: Close-order drill, extended-order drill, physical drills, combat problems, field maneuvers, and night marches. The night march over rough terrain is one of the most difficult things to do while wearing the mask but its accomplishment is most important for in actual warfare conditions the individual will often be required to function at night, either marching or on fatigue work, while wearing the mask.

(4) The foregoing applies particularly to dismounted troops. Mounted troops experience less difficulty in wearing the mask while mounted. They should have practice in wearing the mask both mounted and dismounted.

(5) Training in wearing the mask should be conducted, when equipment is available, for at least 1 hour per week, and once each month the mask should be worn continuously for 1 hour. In the event of a mobilization, the troops should wear the gas mask continuously for at least 1 hour per day for the last week in the training area.

b. In operations.—(1) *Dismounted.*—Since dismounted men are subjected to considerable physical activity either on the march or in combat and the added breathing resistance of the gas mask reduces physical efficiency, unit commanders should

require the wearing of the gas mask in combat operations only in case of necessity.

(2) *Mounted*.—Mounted organizations caught by gas in the early stages of the attack with weapons drawn may have to halt in order to adjust gas masks. The wearing of the gas mask does not seriously affect the efficiency of the mounted man; therefore, it may frequently be desirable to adjust masks prior to mounted action.

(3) *Motorized elements and mechanized units*.—(a) The operation of motor vehicles does not require hard physical exercise by the drivers and, since drivers are accustomed to wearing goggles, the wearing of the gas mask has very little effect on their efficiency. Drivers of motor vehicles should be required to mask whenever they are moving through an area in which there is a probability of encountering gas. Mechanized units should mask prior to the attack when they are likely to encounter gas.

(b) If the situation permits, moving motor vehicles encountering gas should be brought to a stop until all personnel has masked. No time should be lost in masking as agents of both the vesicant and lacrimator types affect the eyes. When the vehicle cannot be stopped, the operator should require his assistant to mask first and then take over the control of the vehicle while the driver masks.

33. *Care of the gas mask*.—a. *Responsibility*.—The gas mask is an expensive item of equipment. Its care both as an item for training purposes and as an article for the protection of the individual in war is very important. Extreme care will be exercised by commanding officers to insure the extension of its useful life as much as possible. The primary responsibility for the care of the mask rests with the individual to whom it is issued; however, the unit gas officer, acting for the commanding officer, is responsible for the general supervision of the care exercised in the use, storage, and repair of all masks within the unit.

b. *Causes of deterioration*.—The chief causes of deterioration of the mask are age, prolonged dampness, heat, improper storage, rough usage, and neglect of minor repairs. The rubber parts of the mask gradually deteriorate with age through oxidation. Oxidation is much more rapid in the presence of moisture

and heat. Prolonged exposure to moisture also causes the rotting of the stockinette fabric, the loosening of binding tape, the rusting of exposed metal parts, and sometimes mildew of the safety glass eyepieces. Improper storage frequently causes the collapse of the corrugated hose and a permanent set in the facepiece which destroys the fit. Rough usage may cause a break in the canister, a puncture of the corrugated hose or facepiece, or the breaking of the head harness and head-harness attachments. The life of the mask can be greatly extended by careful use, by proper storage, and by frequent inspection and repair.

c. Inspection.—The inspection specified in gas-mask drill (par. 29 b (7) and (8)) is primarily to instruct the individual in testing the mechanical functioning and state of repair of the mask. This inspection does not in any way relieve the company commander of his responsibility for the care and preservation of company equipment, nor will it relieve the unit gas officer of his responsibility to the commanding officer for the general supervision of all protective equipment. Inasmuch as a short period of improper storage may completely ruin the mask or a single defect render it ineffective, its care and preservation require frequent inspection by the unit gas officer. These inspections will include conditions of storage, care exercised in field and training use, and state of repair.

d. Repair.—Gas-mask repair kits are issued which contain materials, implements, and instructions for minor repairs. The company repair kit is intended for repairs of torn facepieces while the regimental repair kit contains all the materials and tools necessary for making repairs that are possible outside a gas-mask factory. A complete description of these kits and instructions for repair of gas masks are contained in TR 1120-35.

e. Disinfection.—Whenever masks are exchanged or used by more than one individual for training purposes or otherwise, they should be disinfected immediately after use. The disinfection should be carried out as follows:

(1) *Materials required.*—A 2-percent solution of cresol or lysol. A supply of small rags.

(2) *Directions.*—(a) Hold the mask in the hand, saturate a small piece of rag with the disinfectant, and sponge the entire surface of the facepiece, including the outer and inner side of

the deflector. (In this operation the facepiece should not be turned inside out.) Then apply the disinfectant similarly to the outside of the outlet valve.

(b) Pour about a teaspoonful of the disinfectant into the exit passage of the angle tube. Press the sides of the outlet valve with the thumb and finger so as to let the disinfectant run out. Do not shake off the excess.

(c) Allow all disinfected parts to remain moist for about 15 minutes and then wipe out the inside of the facepiece with a dry rag. The mask should dry thoroughly in the air before it is returned to the carrier.

f. Use of antidim.—(1) *Purpose.*—Within the gas-mask carrier, held in a loop, is a small can of antidim. The purpose of this compound is to prevent fogging of the eyepieces.

(2) *How to apply.*—The eyepieces of the mask having first been cleaned, remove the stick of antidim from its can and rub a little of the antidim on both sides of the eyepieces applying the stick itself; then rub it evenly on the surface with the fingers. When this is done, polish both sides of the eyepieces with the cloth which is wrapped about the stick of antidim until they are free of all foreign substances. If properly applied, the eyepieces will have a clear, even surface upon which blown breath will have no effect.

g. Care in training.—The gas mask is sufficiently rugged in construction to withstand ordinary usage. However, its life will be considerably shortened by improper care and use, and also by using the carrier with gas mask in it for purposes other than those intended. Proper care in training requires the observance of the following rules:

(1) Keep the head harness just as loose as possible without losing the fit; the tendency is to keep it too tight, thus breaking the elastic or tearing off buckles and tabs. *Keep the harness extremely loose in the first drills for recruits.*

(2) Do not permit undue stretching of the head harness in putting on the mask. Require trainees to hold firmly to the facepiece until the face is well into the mask.

(3) Do not unnecessarily throw the mask around, or use the carrier as a seat or pillow, or as a receptacle for anything except components of the gas mask.

(4) Dry out the mask and carrier immediately after using and before repacking.

(5) Make repairs promptly when they become necessary.

h. Storage.—(1) The following rules should be observed in the storage of the mask:

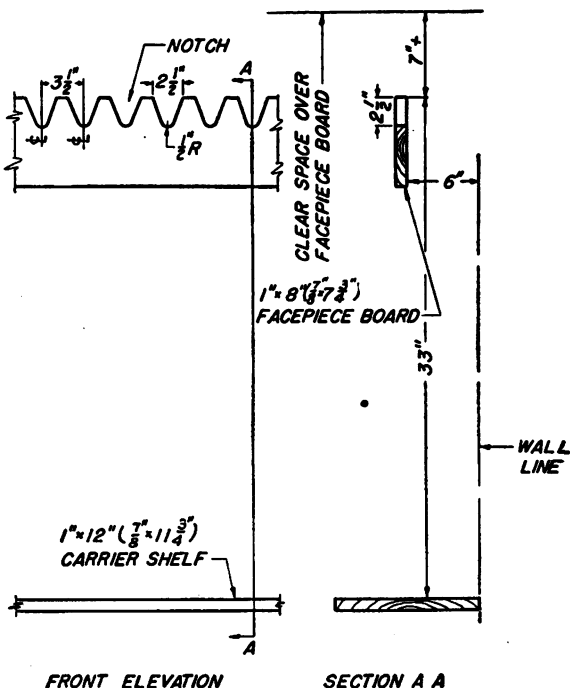
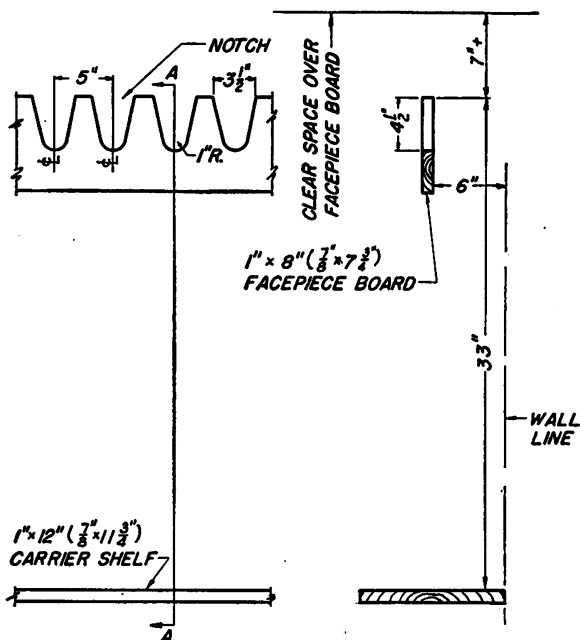


FIGURE 10.—Gas mask storage rack for service masks. (Supports not shown for facepiece board and carrier shelf. All edges of facepiece board to have $\frac{1}{8}$ -inch R. chamfer. All lumber to be well seasoned and to be finished on all surfaces. Rack to be finished with 2 coats of paint.)

- (a) Store in a cool, dry place.
- (b) Do not store in sunlight or adjacent to steam radiators, stoves, or furnaces.
- (c) Do not place in storage when either the mask or carrier is wet or damp.

(d) When the facepiece is in the carrier, keep the hose tube well rounded in the bottom of the carrier, thus preventing pressure on the tube by the flutter valve guard and subsequent collapse of the tube.



FRONT ELEVATION

SECTION A A

FIGURE 11.—Gas mask storage rack for diaphragm masks. (Supports not shown for facepiece board and carrier shelf. All edges of facepiece board to have 1/8-inch R. chamfer. All lumber to be well seasoned and to be finished on all surfaces. Rack to be finished with 2 coats of paint.)

(e) Keep the face form in the facepiece, or in the absence of a face form, stuff the facepiece with newspapers. This prevents creasing of facepiece.

(f) Keep the mask where it will not be damaged by a blow or heavy weight.

(g) If the rubber in the facepiece becomes sticky in hot weather, sprinkle with talcum powder.

(h) If adhesive tape becomes loose, replace promptly before rust begins on binding wire.

(i) Repaint the canister whenever necessary to prevent rusting.

(2) Gas masks issued to organizations in garrison should be placed in storage racks. These racks, constructed as shown in figures 10 and 11, hold the masks in such manner that collapse of the corrugated hose or creasing of the facepiece is impossible.

34. Fitting the horse mask.—In adjusting the horse mask, slip the mouthpiece of the mask well into the horse's mouth, at the same time passing the mouth of the mask over the horse's upper jaw. Pull the drawstring tight to secure a snug fit and slip the elastic straps of the mask harness over the head and behind the ears. The drawstring when tied should be several inches above the nostrils. At the junction of the burlap front strap and the elastic straps is a flat metal hook which should be fastened to the crown of the bridle.

SECTION VI

FIRST AID FOR GAS CASUALTIES

35. General.—*a.* The importance of first aid for gas casualties must be strongly emphasized. There are certain simple rules which all individuals must know. Unit commanders particularly must understand which gas casualties are allowed to walk to the rear.

b. First-aid measures are prescribed by the Medical Corps. (See ch. 2, BFM vol. I.) Unit commanders are responsible for instruction in first aid for gas casualties the same as for casualties from other causes.

c. First-aid measures for the principal chemical agents are summarized in the paragraphs below.

36. Lacrimators.—Men who are lacrimated do not require evacuation as casualties. They only need to leave the contaminated atmosphere and face the wind, allowing it to blow into their eyes. They should not rub their eyes; their clothing and equipment should be loosened so as to get rid of

entrapped gas. Bathing the eyes in cold water or with a weak boric acid or sodium bicarbonate solution will aid.

37. Irritant gases (sternutators).—These agents, such as DM, are not lethal in field concentrations. They may, however, cause such disability as to require evacuation.

a. Remove patient from the contaminated atmosphere, keep away from heat, and remove outer clothing. Flush the nose and throat with a weak solution of sodium bicarbonate (baking soda) or of ordinary salt.

b. Breathing chlorine in low concentrations tends to alleviate the irritation. In lieu of other facilities, this may be accomplished by breathing from a bottle containing bleaching powder (chloride of lime), or from a mixture of alcohol, chloroform, and ether. The exposed surface of the body should be washed with soap and water.

38. Lung irritants.—In order to reduce his oxygen requirements to the minimum possible, a lung irritant casualty should be made to lie down and not allowed to walk to an aid station even though he insists that he is able to do so. He should, as soon as possible, be removed from the contaminated atmosphere, his equipment removed, his clothing loosened, and he should be kept warm. In addition to wrapping him in blankets, nonalcoholic stimulants, such as hot coffee or tea, should be given; and he should be evacuated as soon as possible as an absolute litter case.

39. Vesicants.—All of the agents classed as "vesicants" have also a powerful lung irritant action.

a. Mustard gas.—(1) The casualty should be immediately taken out of the contaminated atmosphere or area and his contaminated clothing removed. Should only portions of the clothing be splashed with liquid mustard, these can be cut away. If the face has been exposed, wash the eyes and rinse the nose and throat with a saturated boric acid, weak sodium bicarbonate, or common salt solution. If the vapor has been breathed, the individual should be treated and handled as a lung irritant casualty. First aid must be prompt for little can be done later than 30 minutes after exposure.

(2) Vapor burns on the skin may be lessened or even prevented by thorough cleansing with soap and water (preferably hot) immediately after exposure. Cleansing the exposed

parts with gasoline or kerosene prior to the use of soap and water will facilitate the removal of all traces of the gas.

(3) Mustard burns or skin areas wet with liquid mustard should be immediately and repeatedly swabbed with a solvent, such as kerosene, gasoline, any oil, alcohol, or carbon tetrachloride (pyrene).

(4) Fresh cloths should be used and the spreading of the contamination should be avoided. After cleansing with the solvent, the affected parts should be thoroughly washed with soap and hot water. Cloths used in removing the liquid mustard will be contaminated and should be burned or buried after use. A weak, freshly prepared solution of chloride of lime in water may be used in place of the oily solvent; this solution is itself very irritating to the skin and must, therefore, be removed by subsequent washing with soap and water.

(5) Fresh, uncontaminated clothing must be supplied where necessary. All casualties should be evacuated as soon as possible.

b. Lewisite.—(1) To be of any value against lewisite, first-aid measures must be instituted almost immediately. The treatment is similar to that for mustard.

(2) In lewisite burns, whether from vapor or liquid, the danger of poisoning from absorbed arsenic far overshadows the effect of the actual burn; it is, therefore, imperative to neutralize, if possible, any arsenic present and not yet absorbed. This may be accomplished by the immediate application of some hydrolyzing agent. A 5-percent aqueous solution of sodium hydroxide (caustic soda) has been found very efficient if applied soon enough.

(3) Following this, or in the absence of the hydroxide solution, vapor burns should be thoroughly cleansed with soap and water and then dressed with a ferric hydrate paste. The paste should be spread on thickly, covered with gauze, and allowed to remain for 24 hours. Following the hydroxide solution and cleansing with soap and water, liquid burns should be repeatedly swabbed with some oily solvent as suggested for mustard, again washed with soap and water, and dressed.

(4) Fresh, uncontaminated clothing must be supplied where necessary. All casualties should be evacuated as soon as possible.

40. Incendiaries.—*a.* For burns from incendiaries other than white phosphorus, treatment and handling are the same as for ordinary heat or fire burns.

b. (1) For phosphorus burns, immerse the affected part in water to stop the burning of the phosphorus and pick out the solid particles from the flesh. Wet cloths, mud, or damp earth may serve the purpose if immersion in water is not possible. As phosphorus melts at approximately 111° F., if hot water is used the melted particles may be removed with a cloth or sponge.

(2) The prompt application of an approximately 2- or 3-percent solution of copper sulphate in water will form a thin coating of copper phosphides on the phosphorus particles which will stop their burning at once. The coated particles can then be picked out from the flesh. The copper sulphate solution should be applied by soaking a pledget of cotton, a sponge, or a piece of cloth in the solution and then placing it on the phosphorus. A minute or two is sufficient time for the formation of the metallic covering coat. After removal of the phosphorus, the burns should be dressed. All severe cases should be evacuated.

SECTION VII

ORGANIZATION AND DUTIES OF PERSONNEL

41. Organization for defense against chemical attack.—Organization commanders are responsible for the proper training of their respective commands in defense against chemical attack and, within the means available to them, they are responsible for taking proper measures for the care and maintenance of protective equipment and for the protection of their troops, equipment, and supplies against gas. However, they have on their staffs specialists in defense against chemical warfare who advise them on the proper protective measures and who actively supervise the execution of all such measures under the authority of the commander. (See fig. 12.)

42. Division chemical officer.—*a.* The division chemical officer is an officer of the Chemical Warfare Service assigned to the staff of the division commander. He is the adviser to the division commander on all matters pertaining to chemical warfare and has three specific functions; chemical warfare intelli-

gence, training, and supply. Under direction of the division commander and in cooperation with the G-2 section of the General Staff, he gathers information of enemy chemical warfare activities either through the brigade gas officers or by direct means, transmits it to higher authority, and recommends to the division commander the issuance of such instructions to sub-

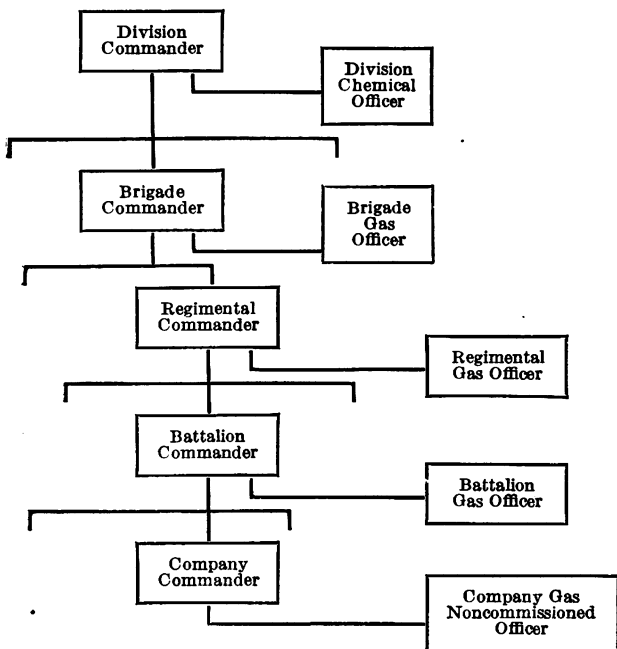


FIGURE 12.—Organization against chemical attack.

ordinate units as are necessary in each instance. He cooperates with the G-3 section in matters of chemical warfare training, recommends such procedure as is necessary in operations to insure defense against chemical attack, and exercises in the name of the commander a general supervision over all chemical defensive activities of the division.

b. It is a part of the duty of the division chemical officer to prepare a standing order for defense against chemical at-

attack for his division. Such an order should be prepared as soon as a newly mobilized division commences to function as such. These orders apply to all routine measures of individual and collective protection which are independent of the tactical situation. He determines whether or not gassed areas are fit for occupation; in the event they are not, he posts them and warns the command of their location. The division chemical officer is the division supply officer for chemical warfare items of protective equipment. In this function through the division G-4, he requisitions supplies from the Army and issues them to regiments and separate units within the division.

43. Brigade gas officer.—The brigade gas officer is an officer of the arm represented and is detailed by the brigade commander as brigade gas officer in addition to his other duties. The functions of the brigade gas officer within the brigade are of the same general nature as those of the chemical officers of higher units.

44. Regimental and battalion gas officers.—*a.* Regimental and battalion gas officers are officers of the branch represented and are detailed by and, unless otherwise directed, submit all reports to their respective commanders. The work performed by these gas officers differs from that of the division chemical officer in that it is mainly limited to protection against chemical attack. The division of duties between the regimental and battalion gas officers is on the basis of the unit or command of which the officer is a part. In some situations their duties may be so closely related that those performed by the regimental gas officer and the battalion gas officers will overlap.

b. The regimental gas officer will exercise general supervision over the battalions in training for defense against chemical attack, the care and issue of protective supplies, and in the work of chemical intelligence and protection before, during, and after a gas attack.

c. The most important of the duties performed by these officers are as follows:

(1) Report all gas shelling promptly, giving time, location, weather, wind; number, size, and kind of shells used; and casualties. Any mustard gas shelling in the unit area should be reported immediately.

(2) Report promptly all changes in gas personnel.

(3) Report name, grade, and organization of all personnel violating standing orders for protection against chemical attack.

(4) Report the condition of gas masks in the hands of troops as indicated by frequent inspections.

(5) Make sure by frequent inspections and tests that alarms in the unit area are adequate and in working order.

(6) Advise lower unit commanders as to the requirements for gas sentries and report to his commanding officer the adequacy of sentries posted as determined by inspections.

(7) Make such inspections as may be required to insure that gas sentries know where all sleeping men in their area are located.

(8) Inspect all gas noncommissioned officers frequently, reporting those by name, grade, and organization that are considered incapable.

(9) Make sure that adequate protective measures are taken for attached units or personnel.

(10) Submit a brief report each week covering the work done during the week as gas officer. This includes the nature of all duties performed and the amount of time required therefor.

d. The regimental gas officer assures himself by inspections that the regiment has a sufficient supply of protective equipment and matériel and that they are in good condition.

e. When the division first goes into action the battalion gas officer must immediately familiarize himself with the topography of the area in which the battalion is to operate. Based on this knowledge, he makes recommendations as to the safety and suitability, from a chemical warfare point of view, of the places that are to be occupied by the different elements of the battalion and in conformity therewith prepares the battalion plan of protection.

f. He carefully observes the meteorological conditions when troops are in contact with an enemy and warns troop commanders when conditions are favorable for an enemy attack.

g. During an actual chemical attack the battalion gas officer observes and assists in the enforcement of gas discipline. He advises his commanding officer and subordinate commanders of the battalion on proper gas defensive action and obtains all possible information of the attack that may be of value in preparing plans of protection for subsequent attacks.

h. After the gas attack he makes appropriate recommendations to his unit commander to correct deficiencies noted during the attack and prepares such plans as may be necessary to meet subsequent attacks. At the direction of the unit commander he makes appropriate action to remedy deficiencies in gas defense of subordinate elements of the battalion.

i. The general problems of gas defense for unit gas officers of artillery units are not so difficult as in infantry units due to greater ease of communication and simplicity in the problems of evacuation. The artillery troops themselves, however, have a disadvantage in that they are more likely to be shelled by large caliber guns containing large amounts of chemical agents. Also, after a chemical attack, there is the problem of cleaning, oiling, and caring for the artillery equipment which has been exposed to the action of gas.

j. It is the duty of regimental and battalion gas officers to see that provision is made for the gas defense of any attached units operating within their organization area.

45. Company gas noncommissioned officer.—*a.* The company gas noncommissioned officer is appointed by the company commander. He assists the company commander in all matters pertaining to defense against chemical attack. Under the direction of the company commander he has three specific functions—chemical intelligence, instructions and inspections, and supply and repair. Acting under the direction of the company commander, he is charged with identification of enemy chemical agents and the detection and posting of gassed areas. He assists the battalion gas officer when in the company area in obtaining specific chemical information. He assists the company and platoon commanders in inspecting the fit and state of repair of masks and acts as assistant instructor in gas-mask drill and identification of agents.

b. He acts as maintenance sergeant for chemical warfare items of protective equipment and, insofar as possible with the repair sets furnished for that purpose, keeps them in a serviceable state of repair. He makes frequent inspections of gas entries and instructs them in their duties; inspects the alarm system, gas-proof shelters, protection of food and water; and warns the company commander when terrain and weather con-

ditions are favorable for enemy gas attacks. He supervises the decontamination of small important localities.

46. Garrison organization.—*a.* An officer of one of the arms, of rank commensurate with the duties involved, will, at those posts where an officer of the Chemical Warfare Service is not on duty, be detailed as post gas officer on the staff of the commanding officer. This officer will supervise the training in chemical warfare of all units at his post and perform the duties prescribed by AR 35-6520 insofar as chemical warfare supplies and ammunition are concerned.

b. On regimental and battalion posts the post gas officer may be the regimental or battalion gas officer. On larger posts a senior officer normally is detailed. The post gas officer, as an assistant to the training officer, in turn coordinates the training schedules of the units in chemical warfare. He provides for the issue of the pooled gas masks in conformity therewith and makes recommendations for the use of the allowances of chemical warfare training munitions.

47. Gas sentries and their duties.—*a.* The duties of a gas sentry are to—

(1) Enforce all specific orders of his post for defense against chemical attack.

(2) Locate the position of all sleeping men in his area.

(3) Detect the presence of chemical agents by odor, color, and state.

(4) Give the alarm whenever gas is detected.

(5) Detect sounds indicating the preparation for and actual enemy projection of chemical agents.

(6) Protect supplies in his area.

b. In the event of a gas attack, the gas sentry will adjust his mask, sound the alarm, and immediately proceed to wake up every man in his area. The gas sentry will not pass on alarms arising in other areas but will give the alarm only when he himself detects the presence of gas. This precaution is necessary in order to prevent the spreading of false alarms. Standing orders of all units will prescribe the duties of the gas sentry in cases of general gas alarms, and it is the duty of all officers in charge of such sentries to insure that they understand these instructions.

c. In addition to their other duties, all sentries will give the alarm whenever they detect the presence of gas. The gas sentry, always on the alert to detect the presence of gas, provides security to the other men of the command and permits them to gain much-needed sleep and rest. This is his most important function. Provision must be made for posting an adequate number of gas sentries over sleeping troops and working parties in the theater of operations to insure that every sleeping man shall be awakened and every man engaged in work warned in time. Each gas sentry should be equipped with a gas alarm, should have a definite area to alarm, and should know when to give the alarm.

48. **Special gas sentries.**—These sentries are usually posted to guard dangerous gassed areas or supplies at distributing points. Their duties do not differ from the usual gas sentry except that they are given special instructions regarding special duties. Special gas sentries on duty where supplies are stored should have protective clothing and masks. Such installations will be chiefly the targets of enemy attack employing vesicant spraying devices. The primary duty of these sentries is to protect the supplies. Since such an air attack develops very fast, the gas sentry has only a few seconds to pull the protective covers into position. He should, therefore, be in a state of readiness to act at an instant's notice. In case the enemy air attack includes incendiary bombs, he will give the prescribed fire alarms.

49. **Standing orders for defense against chemical attack.**—*a. Definition.*—Standing orders for defense against chemical attack are general orders issued by each army, corps, division, or smaller force, if acting independently, which set forth definite and uniform procedure in the protection of the command against gas. The contents of these orders will vary in different commands and in different situations. They will usually contain instructions on the following:

(1) The designation of the zones or areas within which special precautions against gas attacks will be taken.

(2) The special precautions that will be taken in the designated zone; gas reconnaissance, cover, general care and use of protective supplies, care of food, water, equipment, etc.

(3) The directions for the inspection of units to determine status of training in defense against gas and the condition of protective supplies and equipment.

(4) The distribution and general instructions for the employment of gas alarms.

(5) The requirements for gas sentries and general instructions for their employment.

(6) The procedure during and after a gas attack, both individual and unit; the gas alarm; when to put on and take off the gas mask; care of supplies and equipment; action of the unit as a whole.

(7) The use of gas-proof shelters when they are provided.

(8) General instructions for the handling of gas casualties.

(9) The action to be taken by units and individuals to avoid areas contaminated with persistent gas; marking of such areas and guards therefor.

(10) The decontamination operations that will be undertaken and by whom performed.

(11) The reports to be made of gas attacks; when, by whom, to whom, and scope.

(12) Directions on preparation of plans of protection; when and by whom submitted.

b. Time of publishing.—When possible, standing orders are published in sufficient time before entry of a unit into the theater of operations to permit the command to become thoroughly familiar with them. Standing orders for defense against chemical attack should be learned thoroughly.

SECTION VIII

TACTICAL PROTECTION

50. Definition and scope.—*a.* Tactical protection is the term used to designate the disposition of troops in combat and the security measures taken to avoid or greatly reduce the number and severity of gas casualties and to minimize the chances of contamination of supplies and equipment.

b. Tactical protection, therefore, includes such activities as chemical reconnaissance; chemical intelligence; the selection of routes of march, camp sites, and battle positions least favorable to enemy gas attacks; maneuver to avoid gassed areas; schemes

of deployment of units to minimize the effects of gas attacks; and offensive action to forestall or disrupt the enemy's chemical warfare operations.

51. Chemical reconnaissance and intelligence.—*a. Chemical reconnaissance.*—(1) *Distant reconnaissance.*—Distant chemical reconnaissance is conducted by observers in airplanes and highly mobile ground forces such as horse or mechanized cavalry.

(a) *Airplanes.*—Distant reconnaissance by airplane provides accurate information of the terrain. Aerial photographs, both vertical and oblique, show the location of wooded depressions, stream beds lined with underbrush, deep defiles, ravines, etc., which, if contaminated by chemicals, would be serious obstacles to advancing troops. This reconnaissance may provide specific information such as enemy activities indicating installation of chemical mines, cylinders, projectors, etc.

(b) *Mobile ground forces.*—Distant reconnaissance by mobile ground forces should determine the enemy's immediate preparedness for chemical operations, both offensive and defensive. It will be ascertained by observation, raids, questioning of prisoners and inhabitants, etc.

(2) *Close reconnaissance.*—Chemical reconnaissance becomes more detailed as opposing forces draw closer together, particular attention being paid to the terrain with a view to selecting halting points, camp sites, routes of approach, and battle positions which are less favorable to enemy gas attacks. Airplane observation and photographs and ground reconnaissance by cavalry are of value in this phase in developing specific chemical information. Each unit of the main body, however, must reconnoiter on its own front and flanks with a view to selecting routes of approach and alternate routes to be used in case gassed areas are encountered.

(a) *Reconnoitering gassed areas.*—The following information is secured by such reconnaissance: Location and extent of the area; kind of gas and concentration, that is, whether heavy, medium, or low; availability of routes for troops and vehicles for avoiding the area by passing it up wind; availability of routes for passage down wind, determining whether wearing of gas masks will be necessary; feasibility of pre-

paring a roadway or using some established road or path through the area.

1. Low-lying patches of woods, defiles, ravines, and stream beds covered with high grass or underbrush are types of areas that are favorable for gassing with persistent vesicant agents. In situations where there is any likelihood that the enemy is using persistent gas, all such areas should be carefully reconnoitered.
2. Persistent gas having been detected and its character determined, the reconnoitering party, with gas masks adjusted, determines the extent of the gassed area. Some members of the party proceed up wind to determine the up wind edge of the area and possibilities of passage of the area on that side. From time to time they halt and test for gas. They do this as sparingly as possible. In the case of mustard gas, testing for gas every minute or two for 20 or 30 minutes would probably cause severe eye irritation, even though each exposure were exceedingly brief. Moreover, sensitivity to the odor of mustard gas is deadened by continued exposure.
3. Meanwhile, one or more of the reconnaissance detail is making a similar inspection on the down wind side.
4. After the extent of the area has been determined it must be marked with gas danger signs showing the kind of gas and the date of the contamination or its discovery. Other units approaching from the rear should be notified and, if necessary, a sentry posted at the entrance to the area to give warning. Whether it will be necessary to pass through the area in the reconnaissance depends upon its size and whether routes for passing it to one side or the other are available.

(b) *Importance of daytime reconnaissance.*—It is extremely difficult for reconnaissance to be made of gassed areas at night. When practicable, close inspection of the terrain must be made in the daytime in advance of the march, thus avoiding the pos-

sible surprise encounters of such areas. However, if a gassed area is encountered unexpectedly by an advancing unit, it is essential that the reconnaissance be made quickly and decision made as to passage of the area, whether around or through it.

(3) *Battle reconnaissance.*—Gas reconnaissance in battle will include the securing and disseminating of information on the enemy's actual and potential gas activities. After the gas attack has been made it will include the location of gas-free areas for use by troops and the obtaining of information on which to base recommendations for the evacuation of areas rendered untenable with persistent gas.

b. Important factors in chemical combat intelligence.—(1) Chemical intelligence is in general derived through the same means as and as a part of general combat intelligence; namely, reconnaissance and observation. It deals directly with information of chemical activities, intentions, equipment, munitions, and training of the enemy forces in the field, and is handled through the regular intelligence agencies in the same manner as any other information of the enemy.

(2) Information from any source obtained by unit commanders is the basis for planning chemical security for the unit and, with such interpretive comment as they may make, is turned over to the intelligence officer of the unit to be included in his reports to higher headquarters. Thus chemical combat intelligence is coordinated and becomes of general information for the entire Army.

(3) The following factors of chemical combat intelligence are the most important to be considered:

(a) Observation and consideration of local weather conditions; that is, whether favorable or unfavorable for enemy gas attacks of any kind.

(b) Probable intention of the enemy with respect to employment of chemical agents as indicated by his armament and activities.

(c) Location and disposition of the enemy.

(d) Location of terrain features which are likely to be traversed or occupied by our own troops and which are good target areas for gas.

(e) Location of enemy emplacements or installations for projection of gas.

(f) Character and amount of enemy chemical weapons and ammunition with special regard to any new developments.

(g) State of enemy gas discipline, training, and protective equipment.

(h) With respect to any particular gas attack, the amount and kind of chemical agent used; method of attack; number of projectiles fired; caliber, marking, and distinctive features of gas projectiles; location of areas affected; casualties resulting; and any other pertinent data.

(i) Location and extent of contaminated areas.

(j) Interpretation of the enemy's chemical tactics; that is, what they may indicate as to his subsequent intentions.

(k) Information relative to our own use of gas, state of protective equipment of our own troops, including gas-proof shelters and available protection of equipment, food, water, and general supplies.

52. Disposition of troops to meet a chemical attack.—a. Effect of weather and terrain on chemical attack.—Conditions which favor an enemy gas attack and which a unit commander must take into consideration are covered in paragraph 17.

b. Selection of favorable localities.—(1) Defiles, ravines, and depressions are very likely to be heavily gassed by the enemy to hamper and delay the advance of the opposing force. Occupation of these areas should be avoided and in no case entered before a gas reconnaissance is made. Wooded areas or those covered by heavy underbrush should be thoroughly reconnoitered before entering.

(2) As a rule the terrain features which afford the most cover from rifle fire and shells are those which contribute most to the effectiveness of gas. It may sometimes be the case that the gas problem is the lesser of the two, in which case troops should hold their position in a contaminated area.

c. Avoiding contaminated areas.—The effect of nonpersistent gases is of short duration, as the gases dissipate within 5 to 30 minutes, depending upon the terrain and weather conditions. The enemy's use of highly persistent agents, such as mustard, which usually contaminates for several days, offers the most danger to personnel crossing the contaminated area, due to the liquid splashes on the ground, grass, and under-

brush. If possible, these areas should be avoided through proper reconnaissance.

53. Protection against chemical attack from the air.—a. General.—(1) No area can be designated as a safety zone against chemical attack from the air. Both attack and bombardment aviation are equipped for chemical attack on targets within their respective flying range. Bombardment aviation is equipped for projection of chemical bombs; attack aviation is equipped with tanks for spraying chemical agents in the form of a fine rain or mist.

(2) Using proper methods of concealment, the extent of an area which can be gassed in this manner depends upon the number of planes engaged.

(3) In the forward areas it is necessary that all chemical protective equipment be ready for instant use at any hour of the day or night. All installations within bombing range should be supplied with chemical protective equipment necessary for the protection of personnel and supplies against chemical agents released from air bombs or spray tanks.

b. Movements by rail.—Entraining and detraining points are the best targets for gas attacks. It is therefore desirable to utilize a number of such points distributed along the railway line in order that a large troop concentration in any one area may be avoided. Concealment and secrecy of such operations must be sought. Once entrained in covered cars, troops provided with gas masks will be fairly safe against gas attacks.

c. Motor convoys.—Measures aimed at avoiding gas attacks by aircraft upon motor convoys are the same as those applicable to other forms of air attack. Until an air attack is actually launched, it is impossible for the ground forces to determine whether high explosive bombs or chemical agents, or a combination of both, are to be employed. Against high explosive it is advisable that troops leave their trucks and deploy; however, such action will usually increase their vulnerability to chemical spray attack. The judgment of the commanding officer will govern the action to meet each situation as it arises.

d. Marching columns.—(1) In the case of marching columns of troops, whether dismounted or mounted, the possibility of

gas being used by attacking aircraft imposes the same complication in the problems of protective procedure as in the case of motor convoys, namely, the impossibility of foretelling the kind of attack, whether with HE or chemical agents, or both, and the fact that protective formations against bombing attack may be of little or no value against chemicals.

(2) In order to meet this dual situation, troops marching in column must have their chemical protective equipment ready for immediate use at all times. Flank guards, posted and moving with the column at strategic points along the route of march, insure comparatively quick alarm of approaching planes. Troops can adjust their chemical protective equipment as they deploy, assuming any new formation in time to meet an air attack either by HE or chemical agents.

e. General security provisions.—Attack by enemy airplanes equipped for chemical operations can be made upon a marching column at any point along its route but such attacks are more likely to be made at places where nearby woods or hills afford some concealment for the planes in their approach. Defiles and valleys where wind velocity is likely to be retarded are more likely to be selected for attack than are open wind-swept areas. Security provisions in general against air attack on moving columns may be briefly outlined as follows:

(1) *Warning of attack.*—Distant warning from mobile radio observation unit and immediate warning from observation patrols sent out from the column.

(2) *Concealment.*—Night movements are the general rule; varied use of road net to deceive the enemy as to exact route since air attacks are normally planned in advance with the view to striking a moving force at some certain point on its probable route.

(3) *Protective formation.*—Increased intervals between units upon approaching defiles where observation of approach of aircraft would be very restricted.

(4) *Movement.*—As soon as possible after chemical attack by airplanes upon a column, troops are moved up wind out of the gassed area since, aside from contamination of ground and vegetation, the vapor concentration in such an attack is likely to be very high. The up-wind edge of the gassed area will probably be nearby in most cases. Immediate inspection

is made to determine the results of the attack and such first-aid and decontamination measures as practicable are taken forthwith.

f. Use of woods for protection.—While as a general rule of protection against gas, wooded areas will be avoided, there are nevertheless some possible exceptions. For marching columns, it will sometimes be the case that secrecy of movement can be secured by movement through woods thus avoiding air attack of any kind. Where there is a line of woods in full leaf, parallel to a road, and an air attack is expected, it is advantageous for the column to move off the road along the edge of the woods. If then attacked by airplanes using chemicals, troops seek cover in the woods, emerging therefrom as soon as the airplanes have passed. The thick foliage overhead in such a case will probably afford considerable protection against liquid chemical spray. If necessary to pass through high grass or underbrush to reach the woods, it is preferable to remain in the open.

54. Protection during movements into combat.—*a. Camps and bivouacs.*—High ground is sought for gas protection. Heavily wooded patches, especially ravines, are to be avoided. Water sources at camp sites are carefully examined before use for gas contamination. Gas sentries are posted over sleeping men. Where troops are halted for the night in positions likely to be attacked with persistent agents, alternate positions for each unit to occupy in case of necessity therefor are selected.

b. Selection of routes of approach.—(1) Routes of approach along high ground are preferred. Wooded defiles and ravines are regarded with suspicion, avoided if possible and, in any case, reconnoitered for gas before marching into them.

(2) In addition to the route selected for a movement, one or more alternate routes for use in case the route first selected is gassed should be reconnoitered in advance. Selection of alternate routes is particularly applicable in the case of units advancing to assembly positions. While the zone of advance may be clear of gas when it is reconnoitered, it may be gassed later on. The enemy will seek to lay down gas at a time calculated to obtain maximum effect and when it is too late for the advancing force to change plans.

(3) In situations where it is likely that persistent gas will be encountered, advance guards or other covering forces will invariably include a gas reconnaissance party and personnel equipped for decontaminating operations. Such troops, provided with protective clothing, necessary tools, and decontaminating chemicals, will be able to deal with minor gas situations encountered on the march, such as contaminated bridges, road junctions, and obstacles on the road, thus obviating serious delays of the main body.

(4) Upon encountering an area contaminated with persistent gas, its location will be reported immediately to higher authority and marked with signs indicating the gas danger and giving the date on which the gas was discovered. This enables other troops approaching the area at some later date to determine whether it is still likely to be dangerous.

c. Avoiding contaminated areas.—(1) Areas contaminated by a vesicant gas should be avoided by passing them up wind. As to the down-wind distance at which an area contaminated with a vesicant gas may be passed with reasonable safety, several factors must be considered; the depth and width of the area, the gas concentration, the temperature, the wind velocity, and the time required to pass the area in the particular situation are all factors in the gas danger involved. Where exposure will be for 10 minutes or less, it is possible that masked troops could pass very close to the area without casualties resulting, even though the concentrations were very high.

(2) If troops are held up by enemy fire on the down-wind side of a mustardized area, numerous casualties might result even though the area itself was small and the gas concentration low. Assuming no delay, it is probable that in most cases it will be reasonably safe to pass such an area on the down-wind side at a distance equal to its depth. If the odor of gas is detected, gas masks will be worn.

d. Passing through contaminated areas.—Where entirely impracticable to pass around a vesicant-gassed area and troops must proceed forward, consideration should be given to all possible means of minimizing the danger of casualties in passing through the area.

(1) The factors to be considered are the depth of the area; gas concentration; probable length of time troops will be ex-

posed; presence of thick vegetation; whether the terrain is bare or grass covered, wet or muddy, or dry and dusty.

(2) Where there is a hard-paved road through the area, it is probable that troops may pass through on the road without great danger of casualties from gas, provided they wear masks and that they do not remain exposed any appreciable length of time.

(3) Where the road through the area is unpaved and muddy, care should be taken to avoid splashing. On leaving the area, the muddy feet of men and animals should be cleaned with water, brushes, grass, etc. Bands of bleaching powder (chloride of lime) placed at the exit from such areas will assist greatly in neutralizing any agent picked up on shoes.

(4) Where the road or area to be crossed is dry and dusty an effort should be made to prevent a thick cloud of contaminated dust from being raised.

(5) Wooded patches, ravines, hollows, and defiles, and especially lateral stream beds across the zone of advance, may be prepared for passage by sending forward details to cut lanes so that the bulk of the force may pass through without brushing against vegetation. Reconnaissance may result in the location of openings through the area so that little cutting of bushes, grass, or weeds will be required. Details of cutting lanes will be provided with protective clothing.

(6) Long grass and brush contaminated with mustard gas or similar agents may sometimes be burned to render the area safe for passage. During such burning, troops will be kept up wind of the area.

e. Occupation of a position.—In occupying a new position or in the relief of units at the front, unit areas should be reconnoitered in advance of the arrival of troops. In case the area is to be prepared for defense, plans for chemical protection should be coordinated with field fortification plans.

55. Protection during combat.—*a. General plan for protection.*—(1) Each division and component unit at the front has a plan of protection against chemical attack. The guiding principle is to expose as few men as possible without weakening the plan of operations.

(2) In an offensive, the plan is limited largely to a predetermined scheme for shifting the position of units to avoid gassed

areas and for dealing with such areas encountered in the zone of advance.

(3) In defensive situations the plan should be carefully coordinated in the general scheme of defense. Among important considerations are timely withdrawal of troops from areas which are gassed with a highly persistent agent, provisions for covering such areas with fire or for their reoccupation as may be required, general check upon the protective installations and gas discipline, and special attention to the medical arrangements for prevention, handling, and removal of casualties.

(4) If possible, in defensive situations a coordinated and predetermined plan for removal of units to alternate positions should be provided in each division or independent smaller force. The alternate position to which any subordinate unit is to move must be such that there is no serious gap in the line and in general it should be such that the unit can continue to exert its fire power.

(5) Normally the occupation of an alternate position is carried out only on orders from the next higher headquarters. In no case should withdrawal from an original position be undertaken until it is clear that the enemy is using a highly persistent gas in sufficient quantity to render the area untenable.

(6) The battalion plan is made up to cover shifts of positions of companies or platoons within the battalion area in case the position of such companies or platoons becomes untenable due to persistent gas. This plan is submitted to the regimental commander, together with recommendation as to movement of the battalion in case of an attack rendering the whole battalion area untenable. The regiment, the brigade, and the division each in like manner prepare and submit their respective plans to the next higher headquarters.

b. Conduct of troops in chemical attacks.—Where nonpersistent gas is used, troops must prepare to repel an assault. Other than this, all unnecessary movement should cease until the gas has dispersed. Nonpersistent gas is generally employed in situations where the enemy has time and facilities to bring forward the necessary munitions. Since surprise is of great importance, such attacks are likely to be made at night or early in the morning when troops are asleep. After any gas attack, troops should be prepared for a second attack.

c. Importance of offensive action.—Artillery can be used to advantage to forestall gas attacks or prevent the enemy from exploiting them. Whenever installations or preparations for the projection of gas are located, they are promptly bombarded with a view to their destruction.

d. Occupation of vesicant contaminated areas.—(1) The length of time that men wearing ordinary clothing can remain in an area contaminated with a vesicant before becoming casualties will probably not be more than a few hours. Knowing this to be the case, such troops are unlikely to be of much value.

(2) When it is deemed imperative to utilize the position, as few men as are absolutely essential should be left in the area. They should be provided with all possible means of protection and they should be relieved after 2 hours, or sooner if practicable. It will sometimes be feasible to withdraw initially all men from the area, sending a small number back into it only when fire from this position is required.

e. Protection during pursuit.—In pursuit of a retreating force, it is essential that there be no relaxation in gas protective vigilance. The enemy is likely to make extensive use of gas, particularly that of the vesicant type, in rear guard action. Pursuing forces then must be on constant guard against blundering into gas-contaminated areas. Localities likely to be gassed to hamper pursuit should be carefully reconnoitered before troops enter them.

56. Measures taken after a chemical attack.—*a.* As soon after a gas attack as possible, first aid should be given to gas casualties and provision made for their evacuation. Gas-proof shelters, if they have been provided, should be ventilated and prepared for another gas attack. Contaminated food and water should be disposed of; contaminated weapons and equipment should be decontaminated and all metal parts oiled; and contaminated areas that must be occupied should be decontaminated. From the attack it may have been found that additional protective equipment is required or that some of the equipment on hand should be replaced. This equipment should be promptly requisitioned and supplied to the using units and individuals.

b. Report will be made to higher headquarters on the time, place, and extent of the chemical attack, the agent used, if known, and the type of weapon used to project it. As soon as possible, the extent of areas unfit for occupation because of the presence of a highly persistent agent will be determined and a report thereof made to higher headquarters.

c. Areas heavily contaminated with persistent gas will be marked and, when necessary, sentries posted around them.

57. Staff functions of the chemical service in tactical protection.—*a. Advisory duty of chemical officers to commanders.*—It is the duty of the army, corps, and division chemical officers to keep their respective commanders informed at all times of the nature of enemy chemical attacks and the agents being used. In an advisory capacity, they formulate plans for tactical protection in the form of standing orders or as a part of the chemical annex to field orders or special orders.

b. Methods used to test new chemical agents and protective measures.—Included in army troops is a chemical field laboratory which the army chemical officer employs in determining the nature of new enemy chemical agents and in testing and improvising such additional protective measures as may be found necessary. Close liaison is established between the corps and division chemical officers so that chemical intelligence may be transmitted to the army chemical officer with the least possible delay.

SECTION IX

TRAINING IN DEFENSE AGAINST CHEMICAL ATTACK

58. Gas discipline.—*a. Definition.*—(1) For the individual soldier, good gas discipline means that he has a proper respect for the efficiency of gas, but no unreasonable fear of it; that, knowing the value of his protective equipment, he takes care of it; that, upon detection of gas or sounding the alarm, he promptly adjusts his mask and warns others. It implies such training in use of the mask that he is able to wear it for a considerable time and carry on his duties without undue fatigue and that he does not remove his mask until properly ordered to do so.

(2) Collectively, good gas discipline implies maintenance of morale under gas conditions; that there is no panic, but, on the contrary, orderly and prompt execution of the prescribed protective procedure.

b. Psychological reaction.—Psychology plays an important part in gas discipline. Most men are filled with fear before they come in contact with a chemical agent. Proper training in defense against chemical attack will eliminate this. It should be impressed upon men that the Army gas mask, properly used, gives 100-percent protection for the eyes and lungs, and the protective clothing the same against the vapors of mustard gas. Men should be trained to look upon chemical agents as upon any other weapon of war, and should understand that when they make intelligent use of the protective equipment given them, they can encounter chemical attacks with few casualties.

59. Recruit training.—*a.* Before the recruit is turned to duty he should be given training in the rudiments of individual protection. This training should consist of gas-mask drill, care, and handling of the gas mask, and the identification of chemical agents.

b. When the recruit has become reasonably proficient in the steps and marching, and begins instructions in the weapons with which his organization is armed, he should be issued and required to wear a gas mask. Fifteen or twenty minutes a day can be devoted to gas mask drill at odd periods to vary the instruction.

60. Phases of training.—*a. Definitions.*—Training in defense against chemical attack is divided into three phases:

(1) *First phase.*—The school phase.

(2) *Second phase.*—The training of the units, with the assistance of the unit gas officers and noncommissioned officers, in the mechanics of defense against chemical attack.

(3) *Third phase.*—The application of defense against chemical attack to combat by including gas situations in field problems for battalions, regiments, brigades, and divisions.

b. The first phase.—(1) *In peacetime.*—This phase consists of schools during the indoor season to train unit gas officers and noncommissioned officers and to insure the availability of competent instructors for the troops. This is usually accomplished

by conducting a course in defense against chemical attack at each post, camp, and station. The instructor is normally the corps area or division chemical officer. However, graduates of the Chemical Warfare School may perform this duty when the necessity for economy in mileage funds or for any other reason it appears desirable. In some instances, notably in foreign departments where stations are not far apart, it is desirable to order the students to a central point for the course, particularly when extra facilities, such as a chemical company with its allowance of munitions, is available at a particular station. After this course, provision is made in the normal garrison school for the training of company noncommissioned officers and any company officers who may need instruction to enable them to train their units.

(2) *In event of mobilization.*—In order to acquire the uniformity required for operations, the unit gas officers and noncommissioned officers are normally assembled and trained under the personal supervision of the division chemical officer. These trained specialists then in turn will instruct and assist the troop officers in training their units.

c. *Second phase.*—This phase consists of the practical training of organizations in fitting the gas mask, gas mask drill, identification of agents, masking animals, accustoming men and animals to pass through gas and smoke, marching and drilling in masks, the construction and maintenance of gasproof shelters, and degassing of areas and equipment. In peacetime the gas masks of the division, post, or camp will, in general, be pooled for this purpose.

d. *Third phase.*—This phase consists of introducing into normal tactical field exercises of the battalions and higher units chemical warfare features which will require the unit gas officers and gas noncommissioned officers to function in their respective positions; unit commanders will make decisions relative to defensive features; and all ranks will operate while wearing the gas mask in tear gas and smoke. Care must be taken to avoid emphasizing unduly the chemical warfare features of the exercise to the extent of making the exercises illogical or tactically unsound. Insofar as practicable, situations involving defense against chemical attack will be made a part of tactical exercises which are normal to the field train-

ing of units instead of formulating special problems for the particular purpose of illustrating defense against chemical attack.

61. Identification of chemical agents.—An important phase of training in individual protection is the development of the ability of individuals to recognize the presence of chemical agents by their odor. To aid in this instruction there is available for indoor instruction an identification set which is called "Set, Gas Identification, Instructional", and for outdoor instruction an identification set which is called "Set, Gas Identification, Detonation."

62. Set, gas identification, instructional.—*a. Description.*—This set contains seven 4-ounce wide-mouth glass bottles, including two bottles containing charcoal saturated with mustard (HS); one each containing charcoal saturated with chlorpicrin (PS) and lewisite (M1); one each containing diphenylamine chlorarsine (DM) and chloracetophenone (CN) as a solid; and one containing simulated phosgene (CG) (triphosgene), a solid, which upon contact with the air decomposes, giving off pure phosgene. Gas will not generate in a closed bottle of the simulated CG. The charcoal used in these bottles is standard gas mask type activated charcoal which has been thoroughly dried. Enough chemical agent is added to saturate the dry charcoal.

b. Replacement sets.—When several sniff bottles have deteriorated to the extent that vapors are no longer given off, requisition should be made for the necessary sample replacement sets. These replacement sets consist of units of two bottles of agents packed in a wooden box. Upon receipt of the sample replacements, the newly filled bottles should be removed and placed in the standard set. The empty bottles should be placed in the sample replacement box for immediate return shipment.

c. Precautions.—Personnel opening new bottles and containers, or those which have been closed for some time, should wear perfectly adjusted gas masks. Occasionally, pressure builds up within bottles that have not been opened for long periods which is sufficient to throw charcoal or dust into the opener's eyes. It is therefore advisable to have all bottles opened by masked personnel sometime before instruction is begun and then re-corked, after which no great accumulation of pressure can be

expected for another 24 hours. *Bottles not in use should be kept carefully corked at all times.* Care must be taken to insure that bottles and tubes are stored where they cannot be tampered with.

d. Method of testing.—(1) The proper method of smelling the chemical agents in these bottles is to take a moderately full breath immediately before opening a sample bottle. On opening, caution should be used to keep the face away from the bottle. The bottle should be placed in the left hand and held about 10 inches in front of the nose and the right hand used to fan the air across the mouth of the bottle toward the nose. At the same time air should be sniffed in and out of the nose, avoiding deep inhalations. If the odor is not discovered the first time, the bottle should be brought progressively closer until a distinct odor is obtained. As soon as the odor has been detected, replace the stopper in the bottle.

(2) If the odor does not correspond to any described in paragraph 6, the student should note exactly what the agent smells like to him. There is more variation in odor perception than in any other faculty; hence, it is to be expected that different men will describe the same odor in different terms. All odors become more penetrating and stronger as the concentration is increased, so that the concentration, as well as the individual variation in odor perception, must be considered when identifying chemical agents from sniff bottles.

(3) There is no danger in connection with smelling chemical agents prepared in this way. Best results are obtained if only one or two agents are sniffed per day. The method of instruction used in sniff bottles is applicable to small groups only and is exceptionally applicable in the training of instructors; hence, will usually be limited to use in training gas officers and gas noncommissioned officers.

63. Set, gas identification, detonation. — *a. Description.* — This identification set contains 48 sealed pyrex glass tubes, each 1 inch in diameter, $7\frac{1}{2}$ inches long, and containing approximately 1 ounce of the agent or a solution thereof. Twelve tubes each of mustard gas (HS), lewisite (M1), phosgene (CG), and chlorpicrin (PS), are provided.

b. Method of shipment.—Multiple tube containers and individual tube containers cannot be shipped by common carrier unless

securely packed in the steel shipping container; consequently, it is necessary to return the complete set in the shipping container when replacements are required.

c. Method of use.—This set is intended for use outdoors and will be found valuable in training individuals to identify chemical agents under field conditions. The individual gas tubes containing the agent should be prepared for detonation by attaching to them one or two No. 8 commercial detonators, as shown in figure 13. The gas tubes should be wired for detonation as shown in figure 14. Printed instructions for the use of this set, as well as the diagrams illustrated in figures 13 and 14, are placed in an individual tube container and packed in each multiple tube container. The following practical details should be observed when using this identification set:

(1) A line of holes about 10 yards apart should be dug at right angles with the wind direction and one tube of agent placed in each hole. One tube is sufficient for about 25 men. At a signal, an assistant detonates the agents by means of an exploder and the instructor causes the students to sniff the air when the cloud reaches them. In a shifting wind the students will change position accordingly so as to be in the path of the agent. As soon as the students have obtained the odor of the agent they move out of the cloud at right angles to the wind direction.

(2) The exploder box should be placed about 25 yards up wind from the firing line. The class, or observers, should be placed from 30 to 35 yards down wind.

(3) When persistent agents are used, have a spade or piece of board handy and take a sample of the earth from the detonation hole, then have each observer pass by and sniff the odor of the agent given off by the earth.

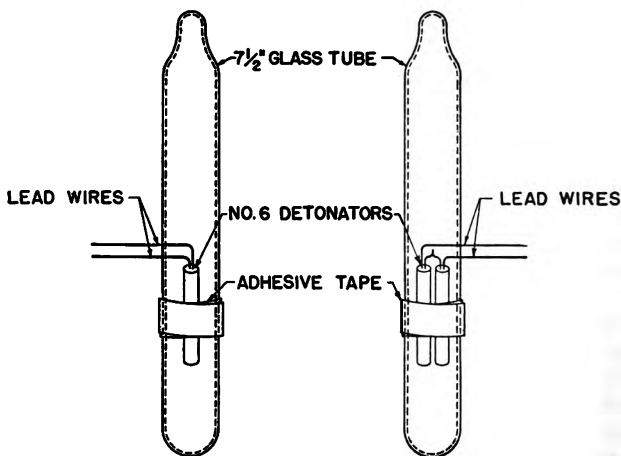
(4) Pieces of glass and liquid spray may be thrown as far as 15 yards. Be sure no person or animal is within this danger radius when the gas tubes are detonated.

(5) Vegetation in the immediate vicinity of the detonation hole may be contaminated from HS and M1 firing, and the ground in the detonation hole is always dangerous for some time. Suitable precautions must be taken to prevent burns.

(6) After a demonstration always fill up detonation holes and remove pieces of glass and wire from the detonators.

(7) Use one No. 8 detonator only on phosgene (CG), chlorpicrin (PS) and lewisite (M1) gas tubes; two No. 8 detonators are usually desirable on mustard (HS).

(8) The detonators should be placed underneath the gas tubes so that the force of the explosion will throw the liquid into the air and produce a good cloud of vapor.



SET-UP WITH ONE
DETONATOR

SET-UP WITH TWO OR
MORE DETONATORS

FIGURE 13.—Glass tube for use in field identification of chemical agents.

64. Standards of proficiency for gas noncommissioned officers.—In addition to proficiency required of the individual, the gas noncommissioned officer must be qualified in the principal duties of training, inspection, and intelligence as unit specialists in defense against chemical attack. These additional proficiency requirements are as follows:

a. Chemical agents.—(1) Ability to identify and prescribe correct protective measures for protection against chemical agents.

(2) Knowledge of procedure in decontamination.

(3) Ability to collect samples of agents during or after a chemical attack.

(4) Rendering of prompt intelligence reports.

b. First-aid treatment for gas casualties.—(1) Knowledge of first-aid treatment required for prevention of and aid to gas casualties.

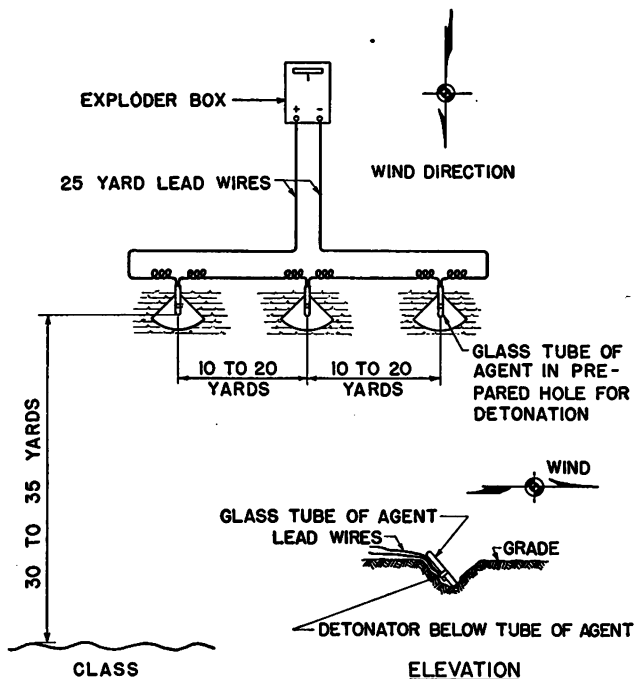


FIGURE 14.—Diagram of detonation of agent set-up for field identification.

(2) Ability to instruct in first-aid measures for gas casualties.

c. Gas masks.—(1) Knowledge of the methods of disinfection and fitting of gas masks.

(2) Ability to make prompt repairs to the gas mask (field repairs only).

(3) Conduct and inspection of gas-mask drill.

d. Protective clothing.—(1) Knowledge of the use of protective clothing during decontamination of mustardized areas and equipment.

(2) Ability to fit and inspect personnel equipped with protective clothing.

e. Gas-proof shelters.—(1) Location of gas-proof shelters.

(2) Knowledge of the methods of ventilation and maintaining gas-proof shelters.

(3) Ability to inspect the effectiveness of gas-proof shelters.

f. Duties of gas sentries.—(1) Knowledge of the duties of gas sentries and their instruction.

(2) Ability to inspect and maintain gas-alarm devices.

g. Protection of animals.—For those having duties in connection therewith—

(1) Knowledge of protection required for animals.

(2) Ability to instruct personnel in animal protection.

h. Training.—(1) Knowledge of the methods of training in defense against chemical attack.

(2) Ability to train and instruct individuals in defense against chemical attack.

65. Training of unit gas officers and noncommissioned officers.—Unit gas officers should be trained in individual schools conducted by the division chemical officers. A minimum of 30 hours should be devoted to this course. A guide for the preparation of an instruction course for unit gas officers and noncommissioned officers follows:

Subject	Practical exercises	Conference hours	Total hours
AGENTS			7
Characteristics and identification of chemical agents.....	3	3	
Effect on men and animals. First-aid treatment.....		1	
PROTECTION			10
Individual:			
The gas mask (including horse mask for mounted units).....	$\frac{1}{2}$	$\frac{1}{2}$	
Protective clothing.....		$\frac{1}{2}$	
Gas chamber.....	1		
Collective:			
Alarm devices.....	$\frac{1}{2}$		
Protective covers.....	$\frac{1}{2}$		
Gas-proof shelters and collective protectors.....	1		
Decontamination:			
Decontaminating materials.....	$\frac{1}{2}$		
Methods of decontamination.....	1		
Matériel:			
Care.....		$\frac{1}{2}$	
Repair and maintenance.....	1		
Supply.....		$\frac{1}{2}$	
Drill:			
Gas mask.....	2		
WEAPONS			2
Weapons and ammunition using chemical agents, including grenades, smoke pots, and irritant candles.....	1	1	
TACTICS			7
Use of lethal and nonlethal gases.....		1	
Use of smoke.....	1	1	
Chemical intelligence and effect of weather.....		1	
Procedure, before, during, and after a gas attack.....		1	
Field exercise.....		2	
DUTIES			1
Unit gas officer and noncommissioned officer.....		$\frac{1}{2}$	
Army, corps and division chemical officers.....		$\frac{1}{2}$	
PROBLEMS ON PROCEDURE AND REPORTS	2		2
EXAMINATION		1	1
TOTAL HOURS	15	15	30

66. Training of troops.—*a.* The following course of instruction (15 hours) in the essentials of defense against chemical attack is furnished as a guide for training of troops, including recruits:

First lesson

Conference—Purpose of course. 10 minutes.

Procedure: Talk briefly explaining (1) course of instruction, (2) general problems of protection, and (3) general methods and measures for obtaining adequate protection. Conclude with questions on the most important points discussed.

Conference—Chemical agents. 20 minutes.

Procedure: Discuss (1) general properties of chemical agents, their physiological effect and identification, (2) general effect of weather and terrain, and (3) difference between lethal and irritant agents. Conclude with questions on important points discussed.

Practical exercise—Chemical agents. 20 minutes.

Procedure: Pass a sample agent around the group. Have various members describe the odor. Compare with the description given in paragraph 6.

Equipment required: Set, gas identification, instructional.

Second lesson

Conference—Chemical agents. 30 minutes.

Procedure: Discuss (1) characteristics of lung irritants and sternutators, (2) their physiological effect, (3) persistency, and (4) general tactical use. Explain method of identification in the field. Conclude with questions on important points discussed.

Practical exercise—Chemical agents. 20 minutes.

Procedure: Pass samples of above discussed agents around the group requiring various members to describe the odor and identify the agent.

Equipment required: Set, gas identification, instructional.

Third lesson

Conference—Protection. 20 minutes.

Procedure: Discuss (1) individual protection, (2) types of gas masks and their sizes, and (3) protective clothing. Describe the various parts and functions of the service mask. Conclude with questions on important points discussed.

Equipment required: A service gas mask.

Practical exercise—Protection. 20 minutes.

Procedure: Issue service-type gas mask. Have the members sling and adjust mask. Fit mask and record sizes. Have the members remove and replace mask. Inform members to bring their masks to all lessons. The instructor should bring a diaphragm gas mask.

Practical exercise—Drill. 10 minutes.

Procedure: Demonstrate gas-mask drill by the numbers and at the command **Gas**.

Fourth lesson

Conference—Chemical agents. 20 minutes.

Procedure: Discuss (1) characteristics of lacrimators, (2) their physiological effect, (3) persistency, and (4) general tactical use, particularly in training and riot duty. Explain method of field identification. Conclude with questions on important points discussed.

Practical exercise—Chemical agents. 10 minutes.

Procedure: Pass samples of above discussed agents around the group requiring various members to describe the odor and identify the agent.

Equipment required: Set, gas identification, instructional.

Practical exercise—Drill. 20 minutes.

Procedure: Conduct gas-mask drill by the numbers, (1) sling the mask, (2) adjust the mask, (3) remove and replace the mask, and (4) unsling the mask. Correct all faults.

*Fifth lesson**Conference—Chemical agents.*

20 minutes.

Procedure: Discuss (1) characteristics of vesicants, (2) their physiological effect, (3) persistency, and (4) general tactical use. Explain method of field identification. Conclude with questions on important points discussed.

Practical exercise—Chemical agents.

10 minutes.

Procedure: Pass samples of above discussed agents around the group requiring various members to describe the odor and identify the agent.

Equipment required: Set, gas identification, instructional.

Practical exercise—Drill.

20 minutes.

Procedure: Conduct gas-mask drill by the numbers as in the fourth lesson and add *Inspect the mask*. Correct faults.

*Sixth lesson**Conference—Chemical agents.*

20 minutes.

Procedure: Discuss (1) characteristics of incendiaries, (2) their physiological effect, (3) persistency, and (4) general tactical use. Review persistence and characteristics of all chemical agents. Conclude with questions.

Practical exercise—Chemical agents.

15 minutes.

Procedure: Cover from view the name on each sample of agent and pass them out to individuals or squad leaders if the group is large. Have the samples of agents identified preferably by written answers. Exchange samples.

If the group is large and the instruction can be done in the field, detonate various tubes of agents and have each agent identified with written answers.

Equipment required: Set, gas identification, instructional.

Set, gas identification, detonation.

Practical exercise—Drill.

15 minutes.

Procedure: Conduct gas-mask drill without the numbers. By engaging in an athletic game, exercise, or other drill, divert attention temporarily from gas-mask drill. As a surprise, give the command *Gas*. Repeat several times.

Seventh lesson

Conference—Chemical agents. 35 minutes.

Procedure: Discuss and explain the effect of the various chemical agents on men and animals, giving the first-aid treatment to apply in the prevention of casualties. Conclude with questions.

Practical exercise—Drill. 15 minutes.

Procedure: Review all movements in gas-mask drill by the numbers. Conclude with questions on purpose of movements in inspection of mask.

Eighth lesson

Conference—Protection. 20 minutes.

Procedure: Discuss (1) collective protection for men, animals, food, equipment, and munitions; (2) use of alarm devices and protective covers; and (3) purpose and proper use of gas-proof shelters. Conclude with questions.

Practical exercise—Drill. 10 minutes.

Procedure: Review all movements in gas mask drill without the numbers. Explain use of antidim. Explain the difference between, and purpose of, service and diaphragm gas mask.

Conference—Protection. 20 minutes.

Procedure: Discuss the duties of gas sentries and special gas sentries. Explain the necessity for strict compliance with "Standing orders for defense against chemical attack."

Ninth lesson

Conference—Protection. 35 minutes.

Procedure: Discuss the procedure (1) in preparing to meet a chemical attack, (2) during a chemical attack, and (3) following a chemical attack. Discuss protective air measures in general. Explain the dangers in passing through contaminated areas; how to avoid such areas and how to pass through such areas when required. Conclude with questions.

Practical exercise—Drill.*15 minutes.*

Procedure: Final review of all movements in gas-mask drill. Men required to be mounted should be trained in both mounted and dismounted drill. Demonstrates the horse mask to mounted men.

Equipment required: Horse mask for mounted units.

Tenth lesson***Practical exercise—Protection.****50 minutes.*

Procedure: Prepare a gas chamber. Explain the purpose of the gas chamber. Inspect the fit of all masks. Release the prescribed gas in the gas chamber. Have the men enter the gas chamber, following the procedure outlined in paragraphs 31 and 32.

Equipment required: Gas chamber or improvised tent and CN capsules.

Eleventh lesson***Conference—Protection.****20 minutes.*

Procedure: Discuss (1) care of protective equipment in general; (2) method in storage; (3) care in training; and (4) disinfection of the gas mask. Conclude with questions.

Practical exercise—Protection.*30 minutes.*

Procedure: Demonstrate (1) method of making repairs to protective equipment (gas mask, TR 1120-35); (2) use of the company gas-mask repair kit (for facepieces only); and (3) use of regimental gas-mask repair kit for general repairs to service gas masks. Conclude with questions.

Equipment required: Kit, repair, gas mask, company.

Kit, repair, gas mask, regimental.

Twelfth lesson***Practical exercise—Tactics.****1 hour.*

Procedure: During the conduct of regular drill (squad, platoon, or firing battery), represent a gas attack by subjecting the unit to a nonlethal chemical agent in order that men may be accustomed to wearing the gas mask without cessation of their

normal activities. Tear gas is suitable for this instruction. The attack should come as a surprise and be repeated at least once, testing for gas following each attack.

Equipment required: Tear-gas candles or grenades.

Gas masks for all troops.

Thirteenth lesson

Practical exercise—Tactics.

1 hour.

Procedure: During the conduct of regular maneuvers or exercises (platoon, company, battery, or troop), include the use of smoke set up by smoke candles or other prescribed munitions to screen the advance or withdrawal of troops. Situations so selected should be tactically sound.

Equipment required: Smoke pots or candles.

Gas masks for all troops.

Fourteenth and fifteenth lessons

Practical exercise—Tactics.

1 hour.

Procedure: During the conduct of regular maneuvers or exercises (company, battery, troop, or larger unit), include the use of a nonlethal chemical agent simulating the enemy's employment of a highly persistent lethal agent such as the vesicant mustard. Have the troops take the necessary protective measures to provide tactical security.

b. For troops well-seasoned and in a high stage of gas discipline, the above training can include, in addition, (1) laying of smoke screens and (2) defense against nonlethal gas attacks, if, in the particular situation selected, it is tactically sound to do so.

Equipment required: Simulated mustard, CN solution, or substitute materials such as crank-case drainings, lime water, etc.

Chloride of lime or ordinary slaked lime for decontamination work.

Gas masks for all troops.

67. Training equipment.—The following matériel is desirable in conducting courses of instruction:

a. Chemical warfare matériel.

Gas mask for each individual.
CN capsules (for charging gas chamber).
Set, gas identification, instructional.
Set, gas identification, detonation.
Horse mask.
Smoke pots.
Tear gas pots or candles.¹
Kit, gas mask repair, company.
Kit, gas mask repair, regimental.

b. Ordnance matériel.

Smoke and tear gas hand and rifle grenades.¹
Smoke and gas shell, artillery.¹

68. Rules to be remembered.—The following rules connected with defense against chemical attack should be impressed upon the individual.

a. Do not carry anything in your gas-mask carrier but the mask.

b. Do not neglect the gas mask or allow it to receive rough handling.

c. Do not throw away your gas mask. You may need it later on and it will save your life in a gas attack.

d. Do not give a false gas alarm.

e. Do not breathe after the gas alarm is given until you are sure that your mask is well adjusted to your face and that the facepiece has been cleared of gas by blowing vigorously into the facepiece while holding the outlet valve.

f. Do not remove your gas mask until permission to remove it is given by an officer or a gas noncommissioned officer.

g. Do not enter an unprotected dugout immediately after a chemical attack.

h. Do not talk or move about unnecessarily during a gas attack.

i. Do not become panicky; keep calm and remember your protective equipment is effective if properly used.

¹ Within prescribed allowances.

j. Do not fail to realize that the enemy uses many different kinds of gases, sometimes alone, at other times mixed with other chemical agents, smoke, or high explosive.

k. Do not forget that clothing contaminated with mustard gas should be removed as soon as possible.

l. Do not remove another man's clothing or handle equipment that is contaminated with liquid mustard gas unless you are equipped with protective gloves.

m. Do not forget that mustard gas remains in an area for days.

n. Do not enter an area contaminated with mustard gas unless equipped with protective clothing and gas mask.

o. Do not remain for any length of time in an area contaminated with mustard gas, even if equipped with protective clothing and gas mask, unless required by the tactical situation.

p. Do not fail to post a gas sentry over sleeping men.

q. Do not forget that when the wind is blowing from the enemy between 3 to 12 miles per hour a cloud chemical attack from the enemy may be expected.

r. Do not forget that during a calm, in foggy or cloudy weather, and at night, ideal conditions exist for a chemical attack. Be on the alert.

s. Do not allow men to drink water or eat food contaminated with chemical agents.

t. Do not forget that all gas cases require, first, rest; second, warmth; third, fresh air.

u. Do not permit men who are casualties from inhaling gas to walk, talk, or move about.

v. Do not bandage the eyes of a gas casualty.

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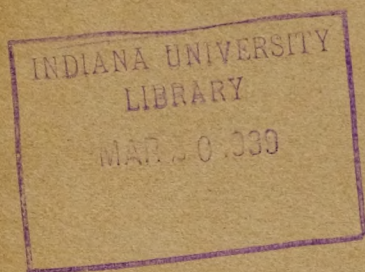
WAR DEPARTMENT

BASIC FIELD MANUAL



Volume I
FIELD SERVICE POCKETBOOK

CHAPTER 9
SCOUTING AND PATROLLING,
DISMOUNTED



BASIC FIELD MANUAL



Volume I FIELD SERVICE POCKETBOOK

CHAPTER 9 SCOUTING AND PATROLLING, DISMOUNTED

**Prepared under direction of the
Chief of Infantry**



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Chapter 9, Scouting and Patrolling, Dismounted, Basic Field Manual, Volume I, Field Service Pocketbook, is published for the information and guidance of all concerned.

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BY ORDER OF THE SECRETARY OF WAR:

MALIN CRAIG,
Chief of Staff.

OFFICIAL:

E. S. ADAMS,
Major General,
The Adjutant General.

(II)

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(III)

BASIC FIELD MANUAL

VOLUME I

FIELD SERVICE POCKETBOOK

CHAPTER 9

SCOUTING AND PATROLLING, DISMOUNTED

(The matter contained herein supersedes TR 200-5, September 29, 1923 (including C 1, January 2, 1929).)

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SECTION I

GENERAL

1. **Scope.**—This manual contains the methods for training individual scouts and small dismounted patrols and the principles upon which their operations are based.

2. **Necessity for training.**—Information vital to the security and movement of a unit is gathered principally by individuals known as scouts or observers and by the operations of small groups known as patrols. In order to accomplish their mission of gathering information or of security, scouts and patrols must be able to operate by night and by day over varied ground and frequently close to or within the enemy position. This duty requires a high degree of training in concealment, movement, and observation. Without this training, casualties among the scouts and patrols will be numerous and the information gathered will be of little value.

3. **Agencies.**—*a. Definitions.*—(1) *Patrols.*—(a) A patrol is a detachment of troops sent out from a larger body on a mission of reconnaissance or security, or both.

(1)

(b) Patrols are classified in accordance with the mission upon which sent, such as reconnaissance patrols, visiting patrols, combat patrols, flanking patrols, or connecting patrols.

(2) *Scouts*.—A scout is a soldier whose duty is to reconnoiter or to gain information of the whereabouts, movements, and condition of the enemy.

b. Employment.—Scouts and patrols are important agencies at the disposal of small unit commanders for gaining information of hostile troops and positions. A group of especially qualified scouts may be formed into a patrol or one or more of these scouts may be attached to a patrol sent on any specific mission. The officer requiring the information must determine whether to employ a scout, a group of scouts, or to attach scouts to a patrol.

4. *Organization*.—All infantry (foot) soldiers receive general training as scouts. Two members of each rifle squad are given specialized training as scouts. An intelligence platoon or section whose members are trained as scouts is included in the headquarters company of each regiment and battalion.

5. *Training requirements*.—Scouts must be taught the following:

a. Terrain features.—To recognize and use the military terms for features of the terrain. Natural features of the terrain are the forms and growths of nature, such as hills, valleys, woods, and streams. Artificial features are the works of man, such as houses, bridges, and railroads. (See fig. 1.)

b. Map reading.—How to orient a map by compass, by two points, by watch and sun, or by the North Star; understand conventional signs, be able to determine elevation from contours, scale distance on a map, solve simple visibility problems, and find his position upon the map or know his position in relation to other positions or objects on the ground. (See ch. 5, BFM, vol. I.)

c. To determine direction.—(1) *With compass*.—To use the compass for orientation and marching, by day and by night, and to determine direction from a map and apply it to movement on the ground. (See ch. 5, BFM, vol. I.)

(2) *Without compass*.—(a) *General*.—If a scout is without a compass, he should, before going upon a mission, carefully study a map of the country to be traversed and fix in mind the

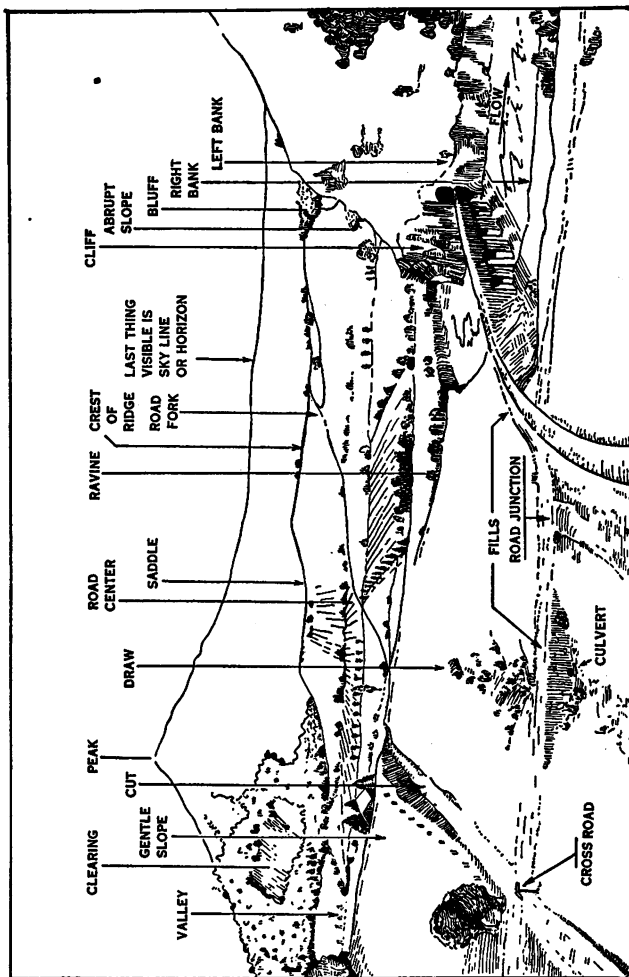


FIGURE 1.—Military features of terrain.

general features, streams, ridges to be crossed, and their relation to the direction to be taken. He should make notes of terrain features and landmarks along his proposed route and rely on his notes for guidance. On his way out the scout should look back occasionally to note the relative positions of landmarks, the slope of the ground, and the direction of streams. This will assist in guiding him on his return. At night, prominent terrain features outlined against the sky are used to maintain direction.

(b) *By watch and sun.*—Within latitudes of the North Temperate Zone which include the continental limits of the United States, the following method, correct to within 8° , may be used

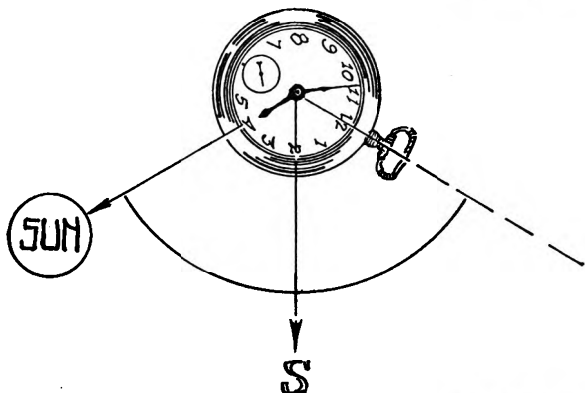


FIGURE 2.—Method of determining direction by watch and sun.

during the hours from 6 a. m. to 6 p. m.: hold a watch horizontally, face up, and point the hour hand at the sun; a line from the center of the dial passing half-way between the hour hand and 12 o'clock (bisecting the smaller arc) will point south. Look along this line and pick out some object in line on the ground. (See fig. 2.)

(c) *By North Star.*—The two stars at the end of the bowl of the Big Dipper known as the "pointers" indicate at any hour the position of the North Star. The Big Dipper revolves around the North Star and the pointers continue to indicate its position. (See fig. 3.)

(d) *When lost.*—Remain calm; halt, try to recall the route passed over, and orient by landmarks or lay of the land.

★

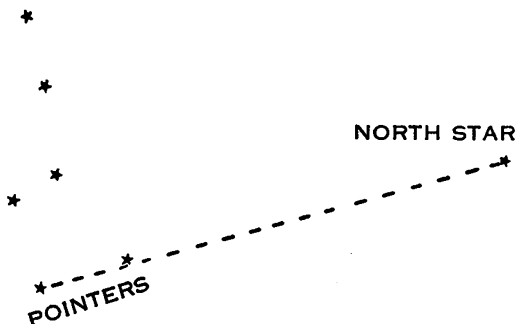


FIGURE 3.—To locate the North Star by means of the Big Dipper.

d. Messages.—(1) Information must be sent back in time for the commander to act upon it. Information may be reported either orally or in writing. An oral message is used when writing is impractical, when the message contains but one simple idea, or when the danger of capture makes it unsafe to place the information in writing. An oral message must be clearly understood by the messenger and he should be required to repeat it before starting on its delivery. Written messages should be on the prescribed field message blanks as shown below, if they are available, and the prescribed form should be followed. Messages should be numbered in sequence for each mission or patrol. If circumstances require the scout or patrol leader to send messages to any other than his commander, that fact should be stated in the next message to the commander so that the break in sequence will be understood. The date and hour of the occurrence reported should be shown. If not shown, it is assumed that the event took place at the time shown at the bottom of the message blank. The place from which the message was sent should also be given. If this is an indefinite point, it may be described by giving its magnetic azimuth with reference to two definitely located points or its azimuth and

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distance from one known point. At times the sender's position may be better described by means of a simple sketch or overlay (fig. 5). Such a sketch may also clarify the other information contained in the message. Information that would be of value to the enemy, such as the name and position of the organization to which sent, is not included in the message.

THESE SPACES FOR MESSAGE CENTER ONLY		
TIME FILED	MSG CEN No	HOW SENT
MESSAGE		
No <u>2</u>	DATE <u>12 October, 1937</u>	
To <u>C. O. Co. B.</u>		
<u>(1) The enemy is digging in on hill 422.</u>		
<u>(2) Saw enemy patrol of four (4) men</u> <u>on road 300 yards east of RJ 345 moving</u> <u>west at 6⁵⁵ A.M.</u>		
<u>(3) Am now on hill 428. Will continue</u> <u>on mission.</u>		
<u>Leader Patrol No. 1</u>		<u>7⁴⁵ A.</u>
OFFICIAL DESIGNATION OF SENDER		TIME SIGNED
<u>Jones, Sgt.</u>		
SIGNATURE AND GRADE OF WRITER		

3-5785

(2) Messages should be written plainly and should state clearly the information secured. If there is any doubt as to whether an earlier message has reached its destination a summary of previous information should be included in a subsequent message.

(3) Facts are recorded in a message in unqualified statements, for example, "The enemy have a machine gun at the barn at RJ 492." Information is reported with a statement as to its source; deductions are indicated as estimates, beliefs, or opinions, for example, "A farmer stated that the enemy have a machine gun at the barn at RJ 492." The exact locality

where an event occurred or where an object is seen should be given; if not, it is assumed that the event occurred at the place from which the message was sent. In concluding a message, the writer should state his intended action; for example, to continue on his mission, to remain in observation, or to proceed to a designated locality. The writer should read the message over carefully after he has written it and preferably have some other person read it in order to check the clarity of its meaning. When signing a message, the sender uses only his surname and title, as *Smith, Cpl.* Messengers must know where the message is to be delivered and the route to be followed. In friendly territory and close to friendly troops, one messenger is sufficient. In hostile territory or during artillery concentrations, two messengers go together or two messages are sent by different routes.

(4) Whether information should be sent back at once depends upon its importance and upon whether delay in transmitting the information will detract from its value. Also, a patrol should not be weakened by sending so many messengers that it will be unable to perform its mission.

e. Sketches and overlays.—Information which is difficult to describe may be shown accurately on a sketch or overlay. Sketches are of two types—panoramic and topographical. An overlay is a piece of transparent paper or cloth to be placed over a map or chart, upon which the position of combat groups, weapons, or other data of a military nature are drawn, and which facilitates the transmission of pertinent data. Overlays are made from the map in possession of the scout and, to be understood, require a similar map to be in the possession of the receiver.

(1) *Panoramic sketches.*—A panoramic sketch is a picture of the terrain in elevation and perspective as seen from one point of observation. It conveys information of the terrain to the person to whom the sketch is sent. A panoramic sketch made by one scout will assist another scout in orienting himself, in getting the same view from the same position, and will enable him to pick up quickly the information conveyed by the sketch. The method of making a panoramic sketch is described below (fig. 4):

(a) Determine what information it is desired to transmit.

(b) Draw the more or less horizontal lines of the landscape.

(c) Put in the prominent points. Leave out unimportant details.

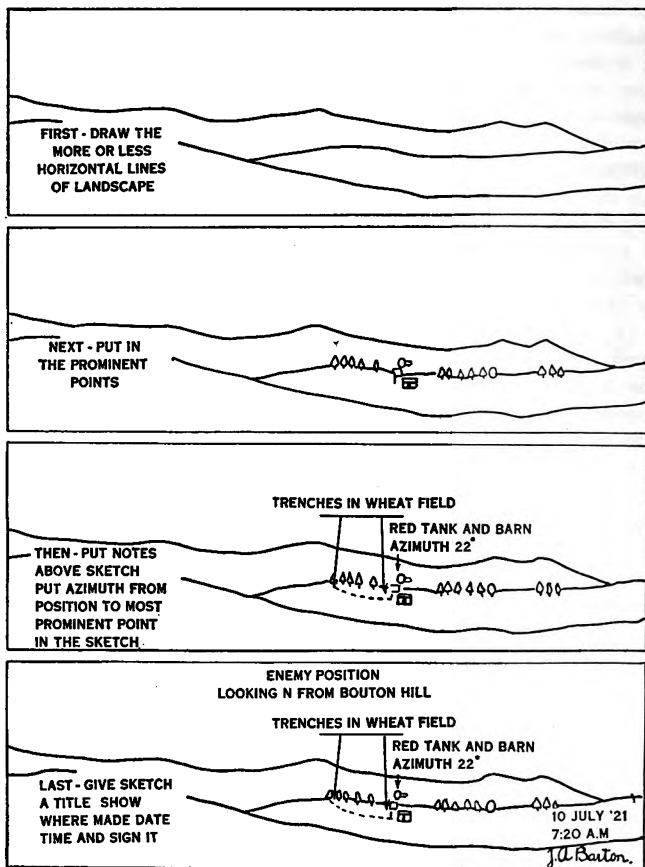


FIGURE 4.—Method of making a simple panoramic sketch.

(d) Do not show the foreground.

(e) Indicate on the sketch the location of the information it is desired to transmit.

(f) Place any explanatory notes above the sketch with arrows pointing to the features explained.

(g) Indicate the azimuth to the most prominent point in the sketch.

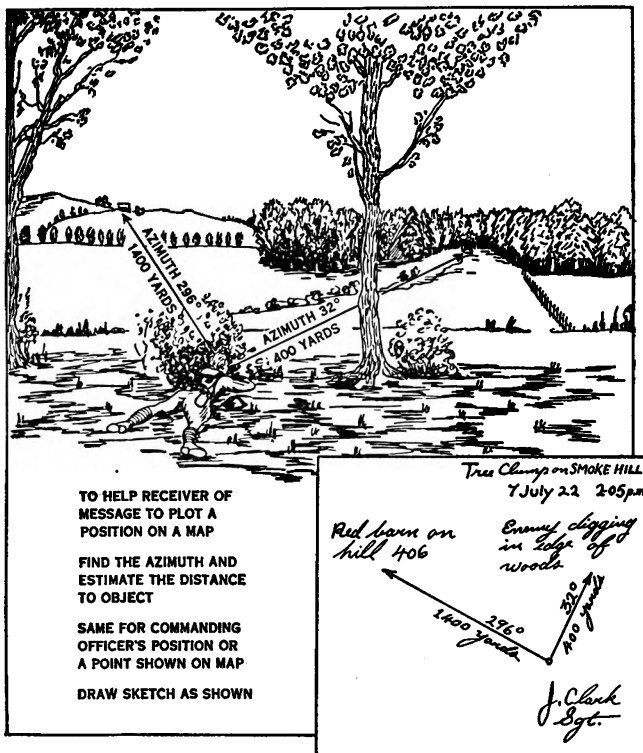


FIGURE 5.—Method of making a simple topographic sketch.

(h) Place a title on the sketch, show where it was made, and indicate the date and time when it was made.

(i) Sign the sketch.

(2) *Topographic sketches.*—A topographic sketch enables the person receiving the sketch to plot on a map the scout's position or the information that the scout desires to convey. The

method of making a topographic sketch is described below (fig. 5) :

(a) Find the azimuth from the position to that of the object seen or of the information to be transmitted.

(b) Estimate the distance.

(c) Draw the azimuth line from observer to object; mark above it the azimuth and below it the distance.

(d) At the proper end indicate the object and at the other end the position of the scout.

(e) Find the azimuth and the distance to some point on the map or to the position of the command post. Draw this line of the sketch and indicate the azimuth, the distance, and the object to which drawn.

(f) Sign the sketch.

(3) *Overlays*.—An overlay supplements a map, showing such things as the position of machine guns or artillery. A map, similar to that used in preparing an overlay, must be in the possession of the receiver so that the information contained on the overlay may be understood. An overlay may be made on any kind of transparent paper, such as tracing paper, pigeon message blanks, second sheets from a field message book, or even on a sheet of toilet paper. The method of making a simple overlay is described below (fig. 6) :

(a) Orient the map on a hard, flat surface.

(b) Place the transparent paper over the part of the map where the object it is desired to show or the information to be transmitted is located and fasten with paper clips, thumbtacks, or pins.

(c) Register the overlay by tracing in the intersecting grid lines at two opposite corners of the overlay and give them their correct number designation. If there are no grid lines on the map, the overlay may be registered by tracing in at least two clearly defined map features, such as road junctions, towns, or streams. This enables the receiver to locate the exact area on the map covered by the overlay.

(d) Sketch in the objects seen or the information to be transmitted, putting these data where they will be seen through the tracing paper if shown on the map itself.

(e) Put all explanatory notes along the margin of the overlay with arrows pointing to the objects mentioned.

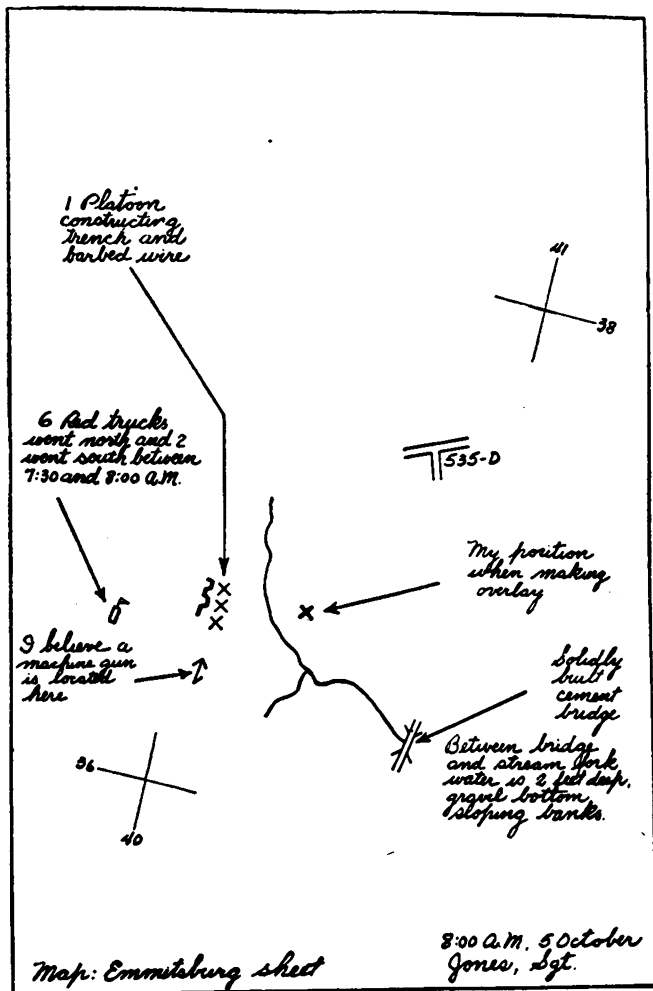


FIGURE 6.—Method of making a simple overlay.

(f) Indicate the position on the map from which you saw the object or obtained the information.

(g) Indicate the title and scale of the map from which the overlay was made.

(h) State the date and hour the information was obtained.

(i) Sign the overlay.

f. To estimate troop organization and strength.—(1) A scout should know the organization of the combat units of his own and of the enemy's forces. By observing troops of his army in camps, on the march, and on maneuvers he becomes familiar with their strength and composition. He should note also their road space, the front they can cover in deployment, and their appearance under varied conditions. He may then estimate the strength of similar enemy units under similar conditions.

(2) The strength of a column on the march may be estimated by noting the time required to pass a given point. Infantry in column of fours occupies one-half yard per man; therefore, there are 200 infantrymen in a column of fours 100 yards long. Cavalry in column of fours occupies 1 yard per man; thus, there are 100 cavalrymen in a column of fours 100 yards long. Horse-drawn artillery in single column occupies 20 yards per gun or caisson. On an average, a point will be passed in 1 minute by 175 infantrymen in column of fours; 110 cavalrymen at a walk, in column of fours; 200 cavalrymen at a trot; and 5 horse-drawn guns or caissons. If the infantry or cavalry is in column of twos, only half as many will pass. The number of vehicles in a motorized column to pass a given point will vary according to the speed of the column and the distance between vehicles. To estimate the number of vehicles in a given column, the number of vehicles passing a given point in 1 minute should be counted and the total time length of the column taken.

(3) Lights, fire, smoke, dust, or noise may give information as to the strength and composition of an enemy force.

6. Aids.—*a. Concealment.*—Hiding from sight or observation gives protection from hostile observation but not from hostile fire. Concealment may be natural or improvised. Natural concealment is that offered by the ground without any change; artificial concealment may be constructed from various mate-

rials such as grass, leaves, or burlap. The scout must become expert in the use of concealment. Observance of the following points will help him to remain undiscovered:

(1) When the scout must conceal himself while performing his missions he should expose nothing which glistens, and his clothing should blend with the background.

(2) Observers should remain motionless and—

(a) Keep the body concealed.

(b) Observe from the prone position.

(c) Keep off the skyline.

(d) Look around the right side of a tree or rock.

(e) Never look over the top of concealment unless the outline is broken.

(3) A scout should keep in the shade so that he will cast no shadow which might disclose his position.

(4) A scout should always fire around the right side of concealment.

(5) Ruses, such as attracting attention to one spot and then observing from another, may be useful.

(6) On being approached by a low-flying airplane the scout should remain motionless, keep his face down and his hands covered. No maps or papers should be left exposed because white shows plainly from the air.

(7) Men with very dark or very light hair should cover it with grass.

(8) The face may be striped with different colored paints or with mud.

(9) Grazing animals may be used for cover while observing the enemy.

(10) Cloaks made of gunny sacks or sandbags, covered with leaves, mud, or clay characteristic of the particular spot, may be used to conceal men who must remain in a fixed position for a long time.

(11) White garments are useful on a snowy terrain, especially on a cloudy, windy day. Care should be taken that the wearer's shadow does not reveal his position.

(12) A sandbag drawn over the head with a few strands taken out in front of the eyes may be used by men observing over a sandbag parapet.

(13) A small thin bush in the shadow of a larger one is sometimes better cover for observation than the larger one.

b. Movement.—When the scout must move he does so rapidly, silently, and from cover to cover.

(1) A lightly equipped soldier moves about more freely than one who is heavily burdened. A scout should carry only necessities.

(2) A scout should not disturb birds or animals.

(3) Any incident which diverts attention, such as an airplane fight or sudden bursts of fire, creates an opportunity to move forward.

(4) If the enemy becomes suspicious of a disturbance at some point, he will watch that point to the exclusion of the rest of the landscape. The scout takes advantage of this by remaining motionless if near the point of disturbance or by pushing forward if some distance away.

(5) Fog or even light haze offers concealment for moving individuals.

(6) It is best to swim a lake or river at night, when in the presence of the enemy. If necessary to do so in the daytime, a small raft for concealing the head may be made with a few sticks or brush and tufts of grass.

(7) A scout moving along a beach should keep close to the water's edge. The spray and rolling waves tend to conceal him from a boat offshore.

(8) When in tall grass or in a wheat field while gusts of wind are blowing, the scout should move forward when the foliage is moving.

(9) When moving down hill toward the enemy in a wheat field or in tall grass, the scout should change direction frequently, as a path in a straight line will be noticed more readily.

c. Tracks.—(1) *Man.*—Scouts should be able to distinguish between the tracks made by various kinds of military footwear, native and foreign.

(2) *Troops.*—(a) A few tracks overlapping each other on both sides of the road indicate a patrol in staggered formation. A large number of tracks indicate troops in column of twos or single file.

(b) A large column wears a dry road smooth and flat.

(c) Mule and small wheel tracks indicate the presence of machine guns, antitank guns, or mortars.

(d) Artillery, tanks, and trains make very distinctive tracks.

(e) The scout familiar with his enemy can, by noting the varying tracks, make an accurate estimate of the composition of the hostile forces.

(f) The condition and morale of troops are shown by the following points: the distance between hourly halts indicates the rate of march; the ground cleaned up after the halt indicates good discipline; rubbish, packs, rifles, and ammunition scattered about show low morale and poor discipline; tracks leaving a column in the direction of orchards, farmhouses, and wells indicate poor discipline; heaps of good stores and materials in good condition left by a retreating force indicate a hasty withdrawal or rout; burned supplies and partially destroyed materials indicate a more orderly withdrawal.

(3) *Vehicles*.—The speed and direction of a vehicle are shown by the following: the side of the road the tracks are on and the side of the road on which the car passes others vary according to custom of the country; a car passing through mud or water will show wet tracks in the direction in which the car was going; mud and water are scattered more by a swiftly moving car than by one moving slowly; piles of dirt and sand are scattered by a swiftly moving car whereas slowly moving wheels leave deep, smooth tracks; a wheel going over holes in the ground leaves deeper marks on the side toward the direction of travel—the greater the speed the deeper this imprint will be.

(4) *Methods of tracking*.—(a) The scout should practice tracking on soft ground, then proceed to more difficult soil, and finally work on rocky ground. In this last stage he should not be discouraged if at first the trail appears blank. Daily practice will bring improvement. The scout in tracking should not continually look at the ground at his feet. He should form the habit of looking forward 20 or 30 paces where scratches on hard ground, bent blades of grass, or twigs which in themselves mean nothing form a line to the front and indicate a trail.

(b) If the tracks a scout is following merge into many others and there is a chance of losing them, he should take accurate

measurements and attempt to pick them up where they emerge from the confusing ones. At times the tracks appear entirely lost and a search must be made to relocate them. In such a case all but two men should halt before their tracks blot out or are confused with those being followed. One man should proceed in the original direction while the second man goes about the spot where the tracks were last seen, in circles of ever increasing size. In making a cast the scout should put himself in the enemy's place and figure out what action would be natural under the circumstances.

d. Routes.—(1) *Considerations in mapping.*—(a) In picking a route from a map, the weather for the past few days should be considered. This precaution is necessary, particularly if the route traverses low ground, creek bottoms, or swamps.

(b) The kind of woods that must be passed through should be considered. Open woods offer few obstacles to movement while underbrush may be almost impenetrable.

(c) Brush is generally thicker in valleys and ravines than on summits and ridges.

(d) The edge of a swamp usually offers a covered route.

(e) Many small features of the terrain not shown on maps offer cover.

(f) A road usually has more bends than are shown on the map. (See fig. 7.)

(2) *To mark return routes.*—(a) Breaking branches, blazing trees, or knotting high grass are methods of marking a return route. Such marks must be made so as to be seen readily on the way back.

(b) The scout's best guide to his return is his memory of the landmarks passed on the way out. He should cultivate the ability to recognize points he has once seen.

(c) Scouts should be trained to return over a different route than the one they took going out.

(3) *To choose routes from a map.*—The scout should be well-trained in map reading. Maps may be used to select covered routes, observation points, and to plan actions in advance. Before starting on his mission the scout should—

(a) Decide where he must go to accomplish his mission.

(b) Study the map until he can picture in his mind the ground he must traverse.

(c) Note the probable dangerous areas such as crossroads, villages, or high points.

(d) Make a plan of procedure.

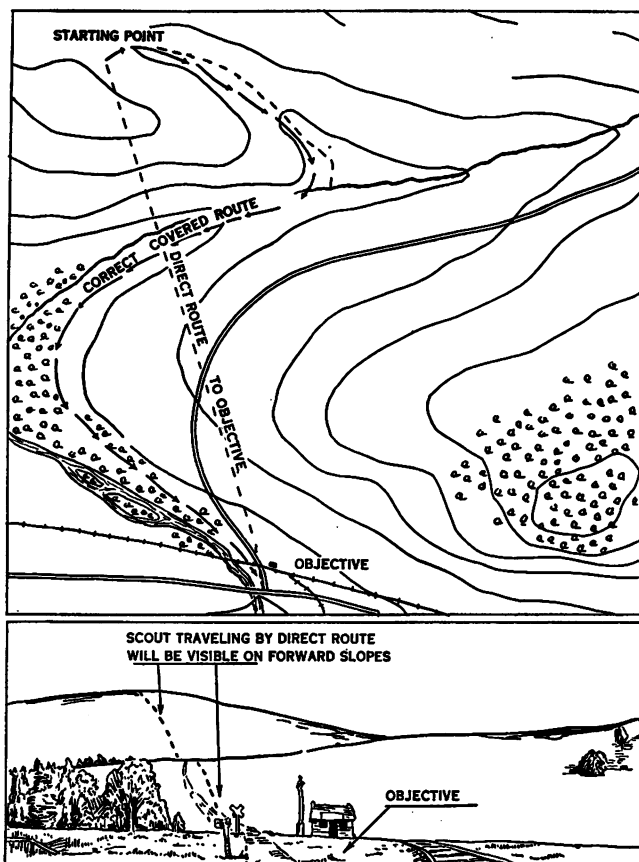


FIGURE 7.—To choose a concealed route of advance from a map.

(e) Select a route following low ground, hollows, and woods.

(f) Pick intermediate observation points.

(g) Determine the compass direction at the start and a reading at each change of direction. (See fig. 7.)

e. What to do if captured.—(1) Each man should be taught that if he is captured he should give only his name, grade, and serial number.

(2) He should not give false, detailed answers, as they are easily checked.

(3) If capture appears unavoidable, all maps, papers, and insignia should be destroyed.

f. Traps.—An enemy making an organized withdrawal may leave mines in dugouts, dumps, houses, or similar places, arranged to explode after the position has been occupied or if disturbed in some manner. Therefore the following should be regarded with suspicion: attractively furnished dugouts; single houses left standing when others have been destroyed; new work or equipment in the midst of weather-worn or soiled articles such as recently disturbed soil, or new metalling, new trench boards, souvenirs left in conspicuous positions, an article sticking out of the ground, such as stick grenades, shovels, rifles, sabers, or wire.

SECTION II

SCOUTING

7. By day.—*a. Concealment.*—The scout must operate in accordance with the principles of concealment as described in section I. (See fig. 8.)

b. Movement.—(1) The scout operates in exposed areas by moving rapidly from cover to cover and remaining motionless when not changing position. The scout acts always as though he were being observed.

(2) When the scout stops in the open or under cover, he should lie motionless with his body stretched out and all parts as close to the ground as possible. To observe, he lifts his head slowly and steadily, avoiding all abrupt movements. When changing position, he avoids exposure which would betray his intentions to the enemy. In crossing an open space, he should spring up, run at top speed with his body bent low, drop, and remain motionless. If a wall or shallow ditch is available he should creep behind it, keeping his head and

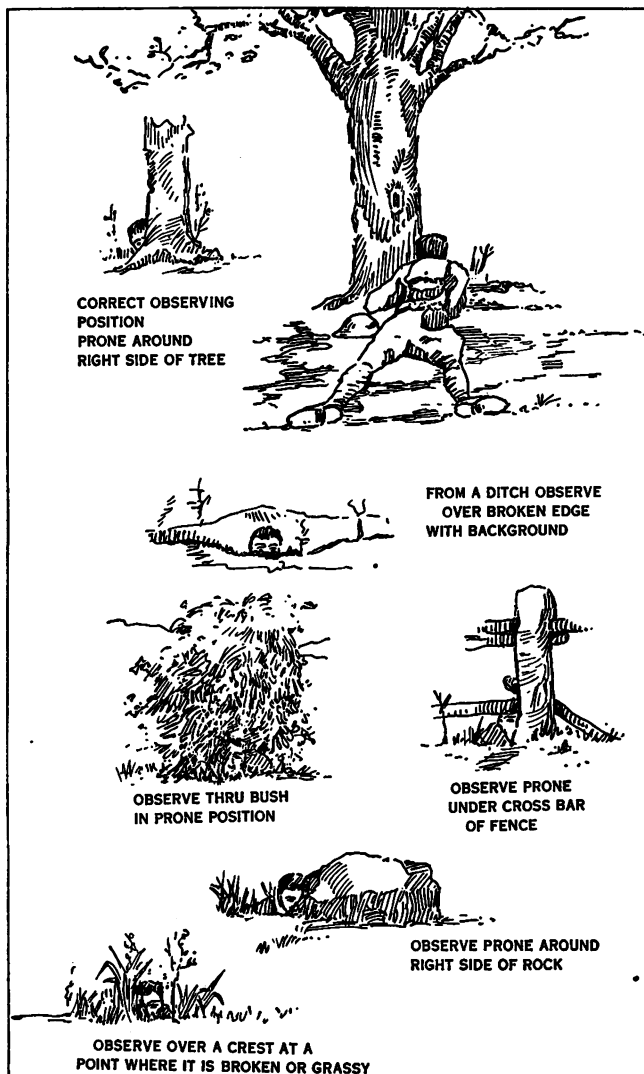


FIGURE 8.—Correct use of cover.

buttocks low. If he is behind a slight rise or very close to the enemy, he should crawl, keeping all parts of his body close to the ground.

(3) In the open, in the presence of the enemy, the scout should move by rushes from cover to cover. Before starting he should select his route according to the cover afforded and



FIGURE 9.—A scout's route of advance, showing the use of cover.

the activity of the enemy. He may need to make wide detours around open spaces or those containing enemy patrols. His advance seldom will be in a straight line for he must move along hedges, hollows, woods, and ravines which run parallel, or nearly so, to his course. He must pick out those places

which the enemy may be using for observation and move as though he were being observed from them. From each covered position he picks out his next stopping place. He chooses

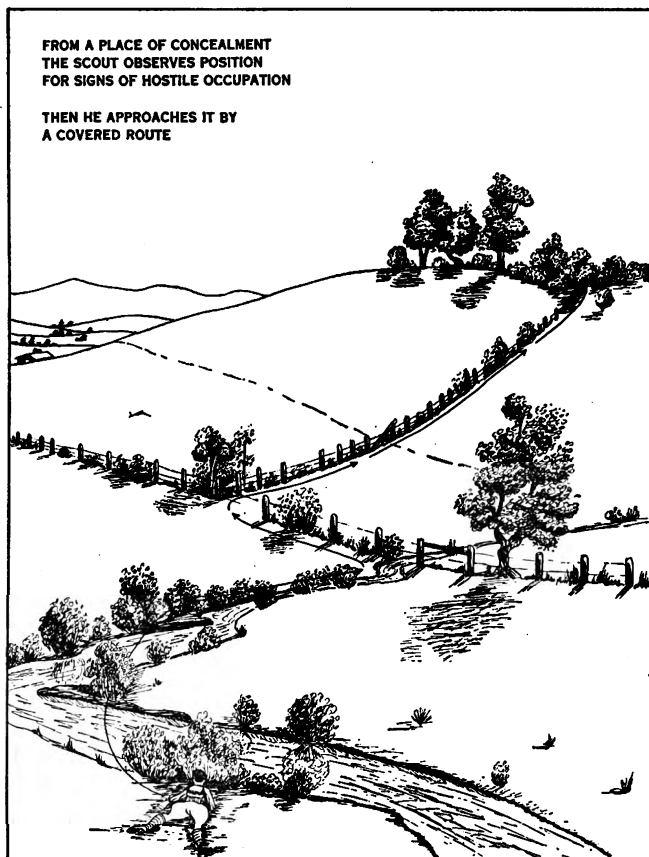


FIGURE 10.—Method of approaching an observing position.

inconspicuous places offering good concealment. Before leaving a covered position he should observe the next stopping place until he is sure it does not conceal an enemy. (See fig. 9.)

c. Observation.—(1) *Positions.*—(a) *Choice.*—In order to carry out his mission the scout must generally occupy one or more observation positions. Before starting, he should study his mission, make his plans, and select observation points either from a map or the ground. When the scout arrives near a previously selected observation position he should observe closely for 10 or 15 minutes to be sure it is not occupied (fig. 10).

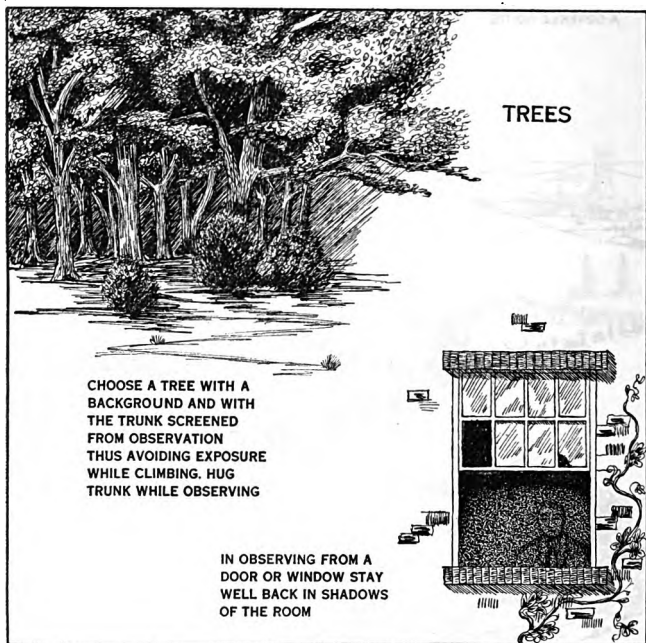


FIGURE 11.—Observing positions, showing correct occupation.

He then decides upon the exact point from which to observe. Of several equally good positions he should choose the least prominent.

(b) *Occupation.*—Having chosen the exact spot from which to observe, the scout moves to it by a covered route. If it is on a hill, he crawls to a place where the skyline is broken. If he observes from a building, he must keep back from doors and

windows. If he climbs a tree, he must pick one with a background so that he will not be silhouetted against the sky either while climbing or observing. He should hug the trunk closely at all times. (See fig. 11.) While observing, the scout must avoid unnecessary movement. He should leave his position by a route different from that of his approach. When an observation post is to be occupied for several days, care must be taken to avoid making a trail that can be picked up by an observer in an airplane.

(2) *To search ground.*—(a) *Value of training.*—The value of a scout depends on his ability to see things which ordinarily are overlooked. He is trained to observe systematically in order to pick up both moving and indistinct and motionless objects. As long periods of painstaking search are often required to find a position from which fire is coming, the ability to do this is of great value in rifle organizations.

(b) *Method of search.*—The scout looks first at the ground nearest him, for his most dangerous enemy will be there. He omits no portion of the dangerous area or place of concealment in his survey. He searches a narrow strip close to him from right to left, parallel to his front. He then searches from left to right a second strip farther away but overlapping the first. He continues in this manner until the entire field of view is covered. (See fig. 12.) Should the scout think that he sees an enemy, he looks a little to one side of the suspected spot for in this way the eye responds more quickly to slight movements.

(3) *To search water.*—In looking across a body of water when the sun is shining, the eyes should be shaded from below to shut out the glare from the water.

8. *By night.*—a. *General.*—(1) Reconnaissance missions close to or within the hostile position can best be carried out on dark or stormy nights.

(2) When the enemy is using many flares he probably has few patrols out; when he is not employing flares his patrols are likely to be numerous.

(3) Chewing gum should be substituted for chewing tobacco as the sound made by spitting is unmistakably human.

(4) A threatened sneeze may often be stopped by pressing upward with the fingers against the nostrils.

(5) A threatened cough may often be stopped by a slight pressure on the Adam's apple.

(6) A ringing noise in the head which interferes with hearing may often be stopped by yawning.

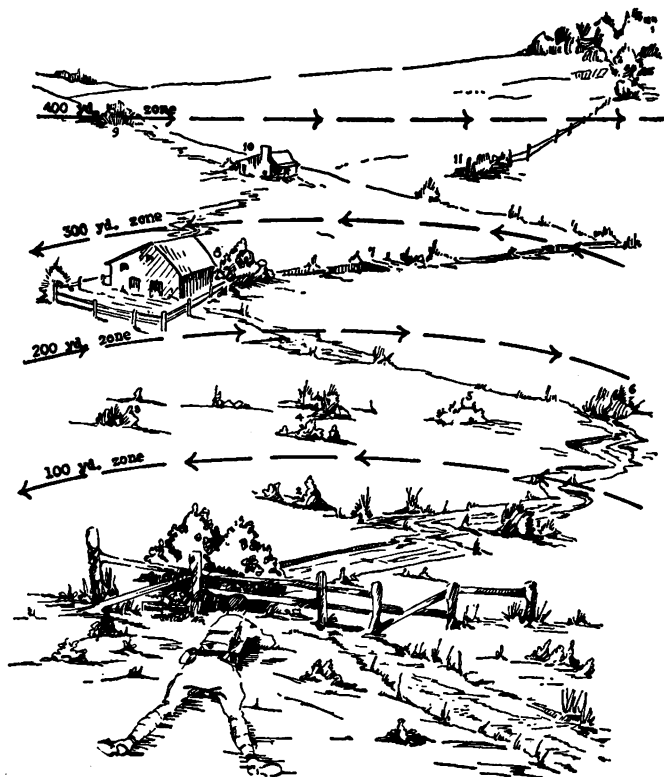


FIGURE 12.—Method of searching ground.

(7) A man who cannot see at all in the dark is said to be night blind and is useless for night scouting.

(8) If whispering is necessary, most of the air should first be expelled from the lungs to avoid hissing.

(9) Delay should be avoided by moving boldly when firing is going on. Advantage should be taken of any sound, such as shelling, wind rustling, or distant firing, to push forward.

(10) In damp and rainy weather when the enemy has been using gas, shell holes should be avoided.

(11) The eyes should not be strained by concentrating on one object too long. If objects blur, the eyelids should be lowered slowly, kept closed for a few seconds, and then opened slowly.

(12) Sounds of men walking are heard better if the ear is held close to the ground. Sounds are transmitted a greater distance in wet weather than in dry.

(13) A flare should never be looked at; the eyes should be kept lowered until the light goes out to avoid temporary blindness.

(14) All patrols or persons met should be considered hostile until proved friendly. When someone is met, the scout should crouch low to get the approaching person silhouetted against the sky and at the same time to offer him an indistinct target if he proves to be an enemy. If fired on close to the enemy line, the fire should not be returned except to avoid capture.

(15) Scouts must be as careful in returning as in starting out, in order to avoid hostile patrols and to keep from being fired upon by friendly sentries.

b. Movement.—(1) Every scout must be able to pass through enemy outguards at night. To do this he must be able to creep, crawl, and walk silently. Unless the night is very bright or many flares are being sent up, the advance may be made by crouching or creeping to within 100 yards of the enemy position. Beyond this point the advance must be made by crawling slowly to within 15 or 20 yards of the enemy line; thereafter further movement is possible only by inches. Scouts must constantly be impressed with the fact that at night, when near the enemy, security depends on silent movement.

(a) *Walking.*—If he goes silently, a scout can make good progress at night because he can walk about unseen.

1. On soft ground, the scout should lower his advanced foot, heel first, and then put the ball of the foot on the ground slowly and quietly.

2. On hard ground, the scout should place the toe first and then gently lower the heel into place. (See fig. 13.)



ON HARD GROUND
SCOUT ADVANCES FOOT AND
PLACES TOE CAREFULLY THEN
LOWERS HEEL. HE THEN
SHIFTS WEIGHT TO ADVANCED
FOOT AND PROCEEDS.

IN GRASS OR WEEDS
THE SCOUT RAISES FOOT SO
THAT IT CLEARS TOP OF GRASS.
PUTS HEEL DOWN FIRST
THEN LOWERS TOE GENTLY

IN WALKING SILENTLY ON
ANY GROUND KEEP
ENTIRE WEIGHT BALANCED
ON REAR FOOT UNTIL
ADVANCED FOOT IS
FIRMLY PLANTED



FIGURE 13.—Method of walking silently at night.

3. Through grass, the scout should raise his foot above the grass before carrying it forward and lowering it, heel first, as on soft ground. (See fig. 13.)

(b) *Crawling*.—Crawling at night is done the same as by day except that before each movement the scout should feel the ground ahead of him to make certain nothing will obstruct his passage or make a noise to reveal his presence. A good scout can crawl to within 5 yards of a sentry without detection, whereas an untrained man probably cannot get closer than 50 yards.

(2) *Flares*.—When a scout hears the sound of a flare leaving its discharger he should drop to the ground before the burst. If he is caught unexpectedly by a bursting flare he should freeze in position and remain motionless until the light dies down. The best time to move is just after the light has gone out. He must be careful not to be caught in motion by recurrent flares.

(3) *Special rules*.—Steel helmets should not be worn on night missions because they make a distinctive noise when they touch barbed wire or other hard substance; they show an unmistakable outline; and they prevent crawling with the face to the ground. Scouts, when near the enemy, should crawl side-wise in moving to a flank.

c. *To pass obstacles*.—The scout's mission often requires him to pass through and work behind the enemy outguards. To do this he must be able to pass through enemy wire and cross trenches quietly.

(1) *Passing wire*.—To cut a gap wastes time. A scout must walk over the low bands of enemy wire and crawl under the high bands.

(a) To step over low wire at night the scout should crouch low so that he can see the strands against the sky. He should then grasp the first strand with one hand and with the other reach forward and feel for a clear spot where he can put his foot without stepping on other strands or any objects apt to make a noise. To avoid catching his foot in another strand he lifts it up and over close to the hand grasping the wire. (See fig. 14.)

(b) Without wire cutters a scout should go under wire on his back, grasping the lowest strands in his hands and holding them clear of his body while he works under them. (See fig. 14.)

(2) *Cutting wire.*—(a) *Method.*—When two scouts work together, one firmly holds the wire close to the cutters, in order to muffle the sound and prevent the loose ends from flying back, while the other scout cuts. They bend back the loose ends to form a passage. A scout working alone should cut

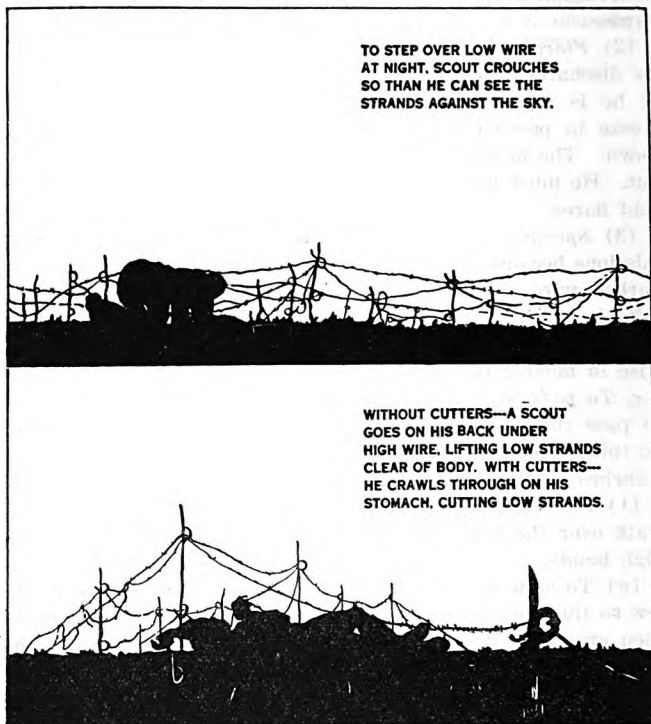
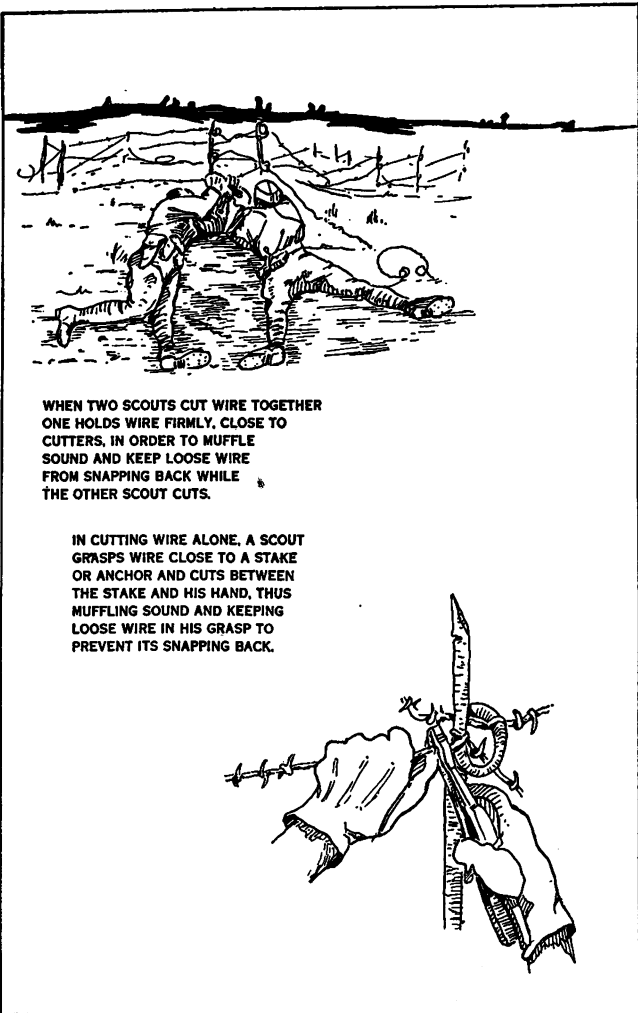


FIGURE 14.—Methods of crossing wire silently at night.

near a post for there he will have but one loose end to dispose of. He grasps the wire close to a post and cuts between his hand and the post, thus muffling the sound and keeping the loose wire in his grasp. (See fig. 15.)



WHEN TWO SCOUTS CUT WIRE TOGETHER ONE HOLDS WIRE FIRMLY, CLOSE TO CUTTERS, IN ORDER TO MUFFLE SOUND AND KEEP LOOSE WIRE FROM SNAPPING BACK WHILE THE OTHER SCOUT CUTS.

IN CUTTING WIRE ALONE, A SCOUT GRASPS WIRE CLOSE TO A STAKE OR ANCHOR AND CUTS BETWEEN THE STAKE AND HIS HAND, THUS MUFFLING SOUND AND KEEPING LOOSE WIRE IN HIS GRASP TO PREVENT ITS SNAPPING BACK.

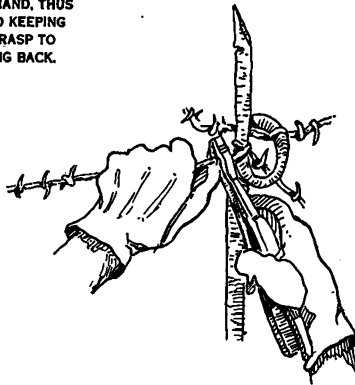


FIGURE 15.—Method of cutting wire silently at night.

(b) *Cautions.*

1. A piece of sandbag wrapped around the wire cutters will deaden the sound of wire cutting.
2. A gap in the wire should not be cut perpendicular to the front.
3. If a gap is cut in the enemy wire, it is well to leave the top wires intact to lessen the chances of its discovery.

(3) *Crossing trenches.*—(a) *Methods.*—The scout should crawl silently up to the edge of the trench and look into it. He should remove all loose dirt and rocks from the edge. If it is a narrow trench, he springs up and jumps across, sinking quietly to the ground on the other side and remaining there a moment listening before proceeding. If the trench is wide, the scout must climb silently and slowly down into it and out the other side, using the revetment to assist him. (See fig. 16.)

(b) *Cautions.*

1. Before crossing a trench, a scout should wait outside for a while and listen.
2. A trench should not be crossed near its junction with a communicating trench.
3. Enemy trenches should not be entered unless for a definite purpose and in compliance with specific orders. Ordinarily, work can be better accomplished from the outside.
4. If it is necessary to enter a trench, it should be crossed and the place where work is to be done approached from the rear. Sentries pay more attention to sounds in front of them than to those in the rear.

d. *Orientation by compass.*—(1) *Use.*—For night work, the scout must understand the use of a luminous compass. Using it, he can guide his platoon into position in the dark, visit adjoining elements of his own command, keep direction when on patrol, and determine the location of gaps in the enemy wire and the position of enemy outguards.

(2) *To march by compass.*—See chapter 5, Basic Field Manual, volume I.

(3) *To locate enemy positions.*—(a) *Gap in enemy wire.*—Having found a gap in the enemy wire, the scout should lie outside the gap and sight with his luminous compass on some prominent point on the skyline behind his own lines. When the

**SCOUT CRAWLS SILENTLY UP
TO TRENCH AND LOOKS IN.
HE REMOVES ALL LOOSE
DIRT AND ROCKS FROM
EDGE IF IT IS A**

NARROW TRENCH



**HE SPRINGS UP—LEAPS
ACROSS THE TRENCH
LANDING ON ONE
FOOT WITH THE OTHER
FOOT HELD BEHIND
TO CATCH HIMSELF IN CASE
HE MISSES EDGE OF TRENCH
IN JUMPING**



**ON THE OTHER SIDE HE
DROPS NOISLESSLY TO
THE GROUND—HE LIES
MOTIONLESS AND
LISTENS BEFORE
PROCEEDING**

WIDE TRENCH

**SCOUT CLIMBS
SILENTLY DOWN
ONE SIDE AND
UP THE OTHER
MAKING USE OF
RETVEMENT FOR
SUPPORT**

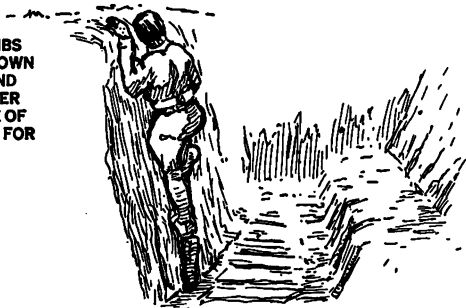


FIGURE 16.—Method of crossing trenches silently at night.

needle comes to rest it is clamped, or if in oil the compass is held steadily. He then rotates the luminous index on the top to a point directly over the north end of the needle. The azimuth of the gap from the prominent point is now registered. The compass is carried back without further adjustment. The azimuth setting can later be recorded on a map. (See fig. 17.)

(b) *Enemy outguards.*—The scout or patrol equipped with several compasses should go to a known point outside of and close to the enemy position and lie there quietly. As sounds of the enemy are heard, sights are taken with one compass and the compass is clamped. Notes are made of the time and nature of each sound, of the estimated distance, and the compass used. These data are plotted on the map when the scout or patrol returns and turns in the notes and compasses. (See fig. 18.)

e. *To estimate direction and distance.*—(1) A scout who has no compass to use at night must decide before starting on some means of keeping his direction. Useful means for keeping direction at night are the direction of the wind, stream courses, stars, and prominent points in the skyline.

(2) Notes made from a map may be helpful in some cases.

(3) The North Star is an excellent reference point and every scout should be able to recognize it. (See fig. 3.)

(4) A prominent object on the skyline or a star near the horizon in the direction of advance may be used as a guide.

(5) Signal lights may be sent up from the outguards to guide scouts who are working out in front.

f. *To estimate sounds.*—(1) At night a scout must depend largely upon his hearing to obtain information of the enemy. He must stop frequently and listen. The ability to listen for long periods in silence must be cultivated. Hearing is as important in night work as seeing is in the day.

(2) The scout who has a compass takes the azimuth to sounds he hears in the enemy line at night and estimates the distance to them. Without a compass he estimates both direction and distance.

g. *Seeing at night.*—Constant practice is required to accustom the eye to night work. The distance at which an object can be seen at night is limited. When the eye is close to the ground so that objects appear against the sky, they are more easily seen. Low-powered field glasses also increase the range of visibility at night.

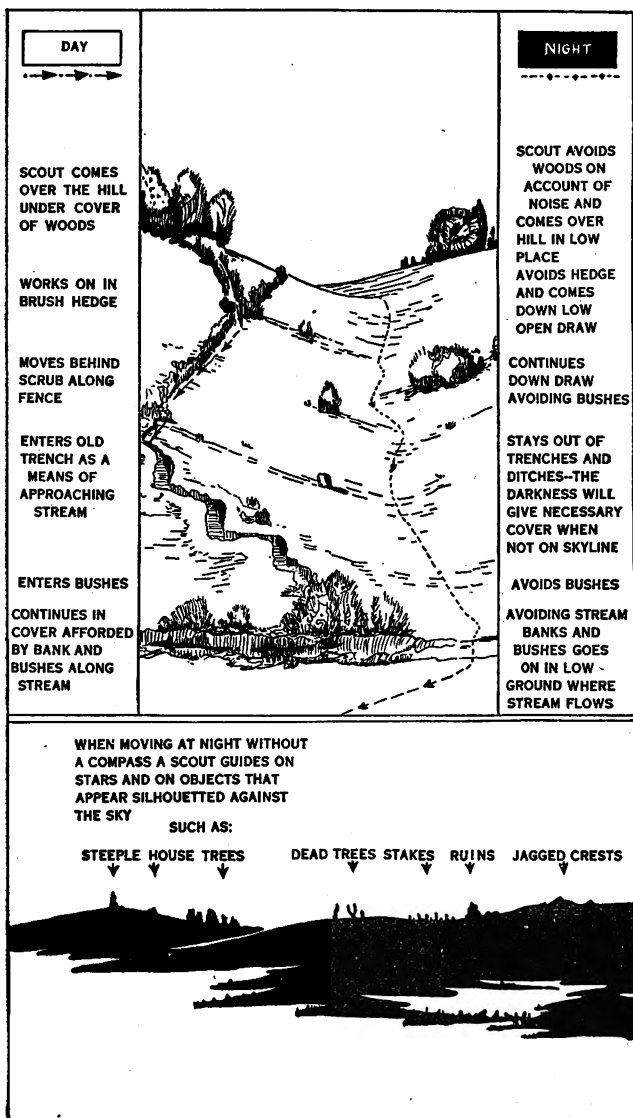


FIGURE 19.—Difference between correct routes over the same ground by day and by night.

h. Selection of routes.—(1) Before starting on a night mission, the scout should study the ground in detail from an observation post, from airplane photographs, and from a map; and make certain of compass directions, prominent points, and (in a stabilized situation) of the location of gaps in his own wire.

(2) The route of advance should be on low ground and always off the skyline. (See fig. 19.)

(3) Darkness gives concealment. Unless the moon is bright, the scout should not pass through woods, ditches, ravines, and brush at night because the noise made in moving through them may lead to discovery.

(4) The scout working at night should always return by a route different from his advance in order to prevent capture by enemy patrols which may wait for his return along a known route.

(5) In stabilized positions the sense of smell may aid patrols. The odor of certain vegetation, or refuse, of a dead man, or of a kitchen may orient scouts and guide them back to their own lines.

(6) Smooth wire stretched from tree to tree may be used to guide patrols through woods at night.

9. Platoon scouts.—Upon the completion of individual training in movement, observation, and taking cover, the scout must learn to fit this training into the tactical work of the unit. Scouts will work together to furnish security and information for the platoon. Men work in pairs. The same two men should always work together so as to develop confidence in each other. They should be members of the same squad.

a. Mission with assault platoon.—(1) When enemy dispositions are not definitely known and the advance of a platoon is not covered by other troops, the forward movement is protected by a screen of scouts deployed at wide and irregular intervals. The scouts advance in accordance with the time schedule or plan laid down by the platoon commander. They overcome resistance from small hostile advanced posts and patrols and force enemy riflemen and machine gunners to open fire and disclose their positions. Without such protection, the platoon is likely to move into areas where enemy fire may prevent further advance or maneuver. (See fig. 20.)

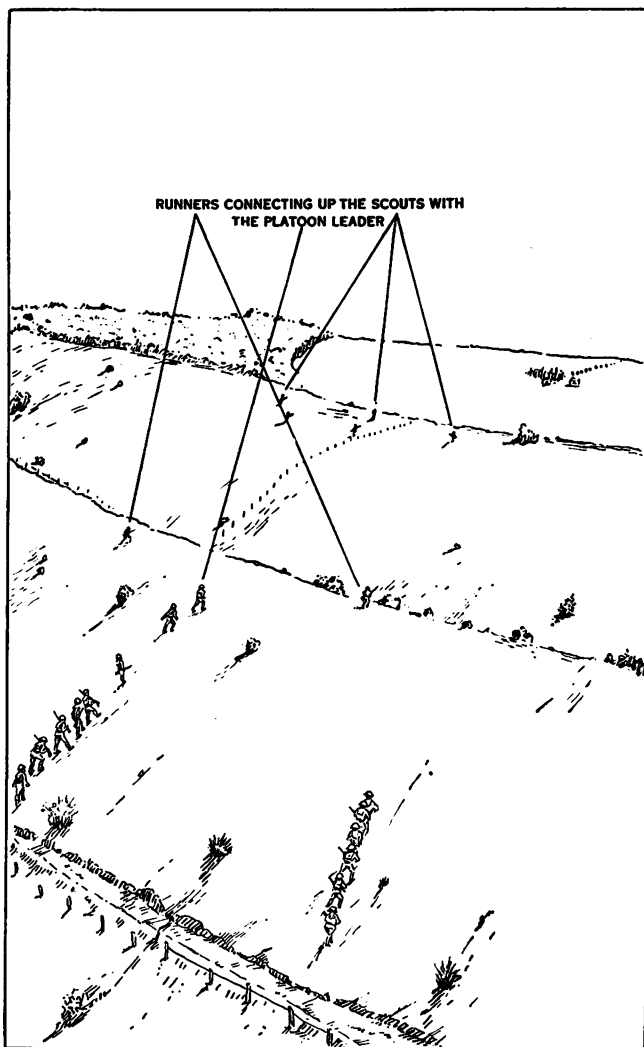


FIGURE 20.—Position of scouts preceding an assault platoon.

(2) The advance of scouts should be screened as far as is consistent with their mission of aggressive reconnaissance to the front. They should take advantage of all cover without delaying their advance. Exposed ground should be crossed at a run. Occasional glimpses of scouts constantly advancing over a wide front will make the enemy uneasy. It is this fact and not the target the scouts offer that causes the enemy to open fire and disclose himself. When fired upon, the scout drops to cover, returning the fire with tracer ammunition and if necessary goes back to point out the hostile position.

b. To locate enemy positions.—(1) The critical points of defensive positions are those points which afford extended observation, either over the defensive zone and its rear or over the ground along which the attack must advance. The enemy will place machine guns and combat groups to defend such critical points.

(2) A scout preceding an assault platoon picks out the probable positions of enemy groups or machine guns and conducts his advance within limits assigned with reference to them so as to secure concealment and cover. (See fig. 21.) Observation of friendly machine guns going into position is excellent training for scouts in determining the location of enemy positions.

c. Action with assault platoon.—Scouts reconnoiter to the front and flanks of advancing elements. As soon as the scouts indicate that all is clear the platoon advances and the scouts move forward for further reconnaissance. Units advance to the attack by bounds. Successive positions along the line of advance are selected and designated by the platoon leader as intermediate objectives and reconnoitered before occupation. By proper reconnaissance and surprise, deployment on wrong lines or in the wrong direction may be prevented.

(1) *Formations.*—Scouts deploy in pairs at wide and irregular intervals, one in each pair covering with his rifle the advance of the other. Their distance in front of the main body of their platoon or section varies with the ground and with the position of the enemy. One moment they may be 500 yards ahead; shortly after, they may be absorbed within their units. In dense woods the scout's movements closely resemble those for night operations. Special reconnaissance must be made before entering clearings or wide roads, or leaving woods. An

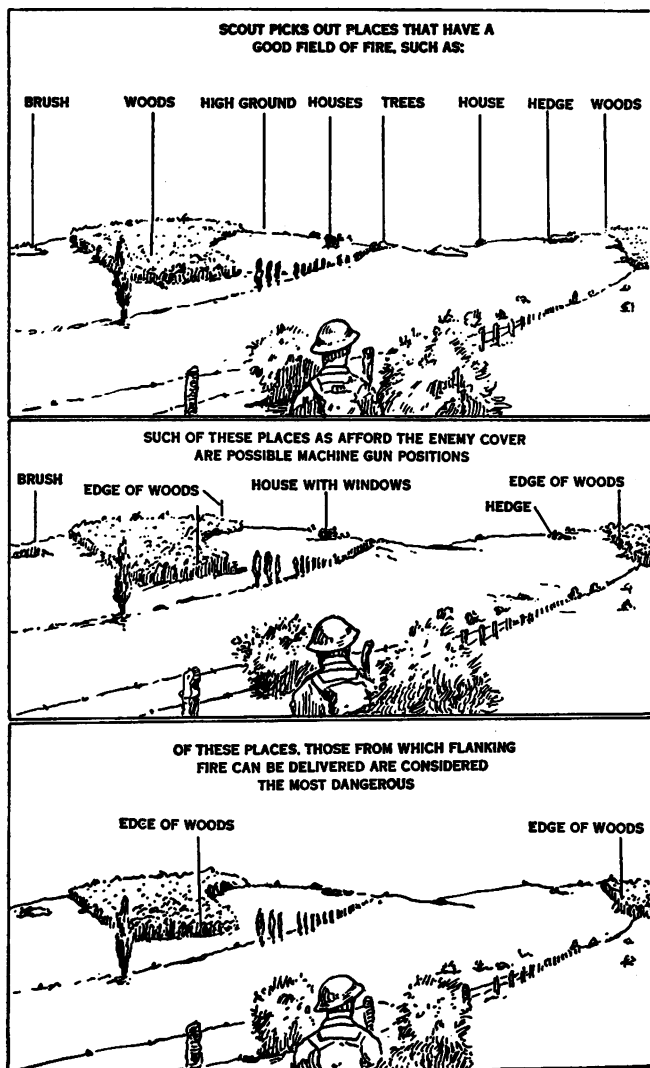


FIGURE 21.—Method of determining probable enemy machine-gun positions.

active enemy requires greater caution than one with whom contact has been lost. In approaching houses, natural defenses, woods, and villages, one scout of each pair covers the other while the latter reconnoiters. (See fig. 22.)

(2) *Action in woods.*—(a) *To enter.*—When scouts reach a woods, one of each pair reconnoiters within for a short distance to make sure that the edge is unoccupied, the other covering his movement. As soon as the scout within the woods determines that the edge is unoccupied he returns to the edge and signals "Forward." This signal is repeated by the second scout to the platoon leader. Both scouts then enter the woods and wait while the platoon comes up and while the platoon leader makes any necessary changes in dispositions or direction. (See fig. 22.)

(b) *To pass through.*—Scouts passing through woods ahead of their section or platoon maintain a distance allowing visual and oral communication. If an obstacle is encountered, reconnaissance to the front and flanks must be carried out. When advancing along a road or path, scouts precede the platoon so as to provide the necessary protection and prevent surprise fire upon the platoon. When crossing a road or path, scouts reconnoiter well to the flanks before signaling "All clear" to the platoon.

(c) *To emerge.*—Scouts will not come out of woods until the arrival of the platoon leader, who will thus be given an opportunity to alter the dispositions or direction of march. They are then sent ahead to reconnoiter the dangerous points and also the next position to be occupied by the platoon. They signal back whether conditions seem to require a halt, an advance, or a quick rush across the open. They must be continually on the lookout for signals from the rear. (See fig. 22.)

(3) *Action under fire.*—When the enemy opens fire the scouts stop, seek cover, and try to determine where the fire is coming from. If the enemy discloses his position, one scout of each pair moves to the best nearby firing position and opens fire with tracer ammunition to indicate the target. The second scout observes and orders necessary changes in range. When adjustment is completed he also opens fire. If the scouts have no tracer ammunition, one opens fire and the other drops back to point out the target to the platoon leader.



FIGURE 22.—Conduct of scouts during an advance.

d. Action with flanking unit.—(1) When a platoon is ordered to outflank a hostile point of resistance, scouts should be used for protection and reconnaissance just as when the platoon is advancing directly against the enemy.

(2) The platoon leader designates the formation for the platoon and the necessary security measures. If the platoon advances in a line formation with squads abreast, the scouts of some or all of the leading squads should precede the platoon and furnish the necessary protection. If the platoon advances in a column formation, one squad may frequently be assigned as the advance guard and, if so, the scouts of that squad will normally constitute the point. The platoon leader must always be in a position where he can communicate readily with his security detachments and with his platoon; that is, either between his platoon and the line of scouts or with his advance guard.

(3) The scouts or advance guard squad, acting under orders of the platoon leader, prevent the platoon from being surprised. When fired upon, they conduct themselves in the manner described in (d) (3) above.

e. To discover enemy gaps.—(1) The attack will not usually encounter a continuous line of defense uniformly held. In general, the enemy will be disposed in a series of positions with intervals between them. Scouts constitute the advance elements of movement into a gap discovered in the hostile front. They should be followed closely by the units which they precede. Under the protection of the fire of the scouts a base of fire is built up on the enemy flanks and rear.

(2) Scouts must be alert for intervals or gaps in the enemy line. Immediately upon discovering them, they push in, take up a position from which flanking fire may be brought to bear on the hostile position, and promptly notify their commander.

f. Action with supports and reserves.—(1) The scouts of support platoons, reserve companies, and battalions are used to keep their commanders informed of the position of the assaulting and adjacent units and of any changes in the situation to the front and flanks.

(2) Scouts are sent in pairs to high ground or to successive observing positions. They keep the unit they are detailed to watch constantly in view and observe its progress. One

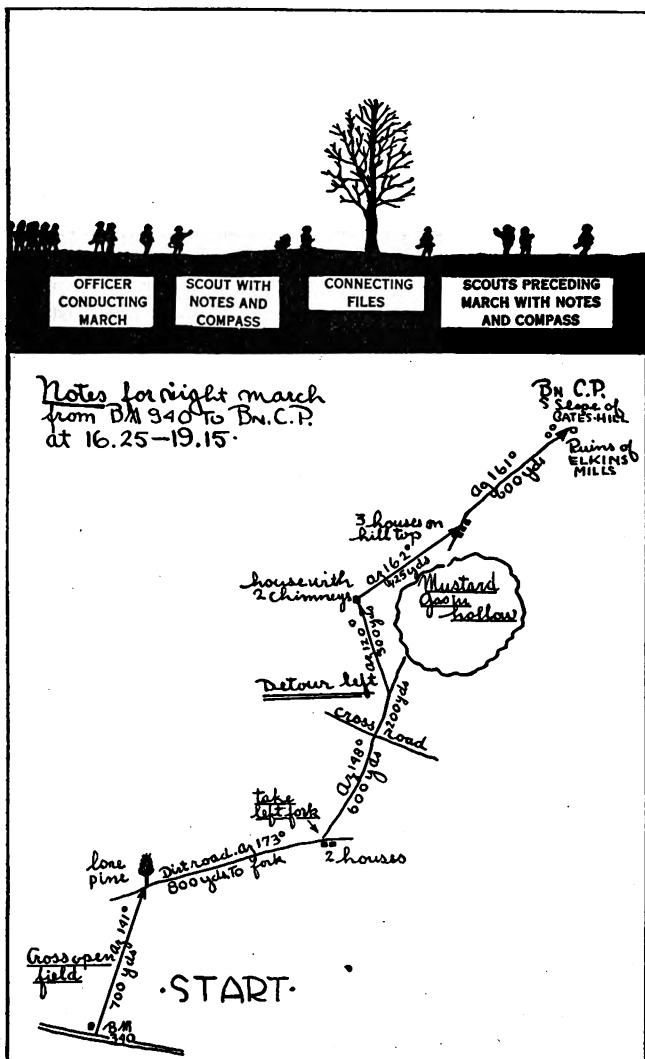


FIGURE 23.—The use of scouts in night marches, showing notes made to keep on the route.

scout should go back to report any incident which affects the progress of the attack, such as a unit being held up by the enemy or by an obstacle, a gap occurring between units, an enemy counterattack, or the approach to a shelled area. The other should remain in observation. Speed in reporting changes in the situation is important.

g. Action on night march.—The column should be preceded by scouts who employ their knowledge of distance, direction, maps, and landmarks to guide their units correctly. (See fig. 23.)

(1) *Preparation.*—(a) Scouts should go over the route by day, making notes as to landmarks, directions, and distances. At critical points, men should be left to point out to the column the proper road.

(b) If it is not possible for scouts to go out on the route by day, these notes may be made from the map.

(2) *Execution.*—Scouts provided with compasses and notes should precede the column. In addition, a scout similarly provided with a compass and a copy of the notes marches at the head of the column to assist the officers conducting the march.

SECTION III

PATROLLING

10. *Use of patrols.*—While a front line unit commander may receive information of the hostile front line from higher headquarters or aerial photographs, the main sources of information available to him are observation groups and patrols. Also, patrols are valuable in keeping down enemy reconnaissance. Whether on the march, in defense, or in the attack, to neglect the use of patrols is to invite defeat. Airplanes and balloons cannot replace patrols. Aerial reconnaissance cannot drive off enemy patrols. Airplanes cannot replace patrols at night, and even the information they obtain by day is not immediately available to the battalion commander. Aerial reconnaissance has increased rather than diminished the use of patrols, because the information of enemy front-line troops obtained from observers or airplane photographs must be verified by reconnaissance on the ground. Activity in hostile air reconnaissance will probably be followed by increased hostile patrolling.

a. On the march.—The formation of the advance guard must be such that the enemy will first be met by a patrol. When the advance is not covered by other troops, the necessary combat patrols are detailed in the march order. The commander directs such special reconnaissance as he desires to have made. To afford protection to an infantry column, the country must be observed on each side of the road as far as the terrain affords positions for effective rifle fire on the column. Where the road is exposed to fire and the view is restricted, a patrol is sent to examine the country in the direction from which the danger threatens. This may be accomplished by sending patrols to observe from prominent points. When the ground permits and the necessity exists, patrols may be sent to march abreast of the column at distances which permit them to see important features which are not visible from the route of march. When separate columns move forward to deploy, each column must reconnoiter to its front and flanks and keep in touch with adjoining columns. The extent of the reconnaissance to the flank depends on the isolation of the columns.

b. Outposts.—An outpost carries out such reconnaissance as is necessary for the security of the resting troops. The most economical protection is furnished by keeping close contact with the enemy by means of outpost patrols in conjunction with resisting detachments along the avenues of approach. Instead of using outguards along the entire front of observation, part of this front may be covered by patrols. Patrols are used to cover such sections of the front as can be crossed by the enemy only with difficulty and over which he is not likely to attempt a crossing after dark. Patrols also are used after dark to supplement and extend the observation of sentries. In daylight, much of the local patrolling may be dispensed with if the country can be seen from the posts of the sentinels. Patrols are pushed well to the front in close country. Patrols must be used to keep up connection between the parts of the outpost except when, during daylight, fractions or groups are visible from each other. After dark, this connection must be maintained throughout the outpost. Any special reconnaissance desired is carried out by patrols detailed in the outpost order. All outpost patrols should be informed as to the direction and strength of the enemy, if known, and the position of

the various elements of the outpost. Prominent features of the terrain, such as villages, streams, and roads, should be pointed out to them and named.

c. Attack.—Before an attack, reconnaissance must be made to determine the enemy position, the position of his flanks, the character of the terrain, and the nature of the hostile field works. The delay that may be warranted for the purpose of reconnaissance depends upon the nature of the attack and the necessity for promptness. In a meeting engagement and in a holding attack, it may be necessary for reconnaissance to be hasty. In an attack against an enemy carefully prepared in defense, there will usually be time for thorough reconnaissance. The strength of the reconnoitering party is determined by the character of the information desired and the nature of the hostile screen. A large party may be used to open the way for small patrols, to serve as supporting or rallying points for them, and to receive and transmit such information as is gained. Each attacking unit must be well protected against surprise. Throughout the action, combat patrols are required to give warning or covering detachments to give security on exposed flanks. The battalion usually employs patrols to—

- (1) Cover the interval between the battalion and neighboring units.

- (2) Protect the flank of the battalion in case the neighboring battalion is checked in its advance.

d. Defense.—The front of each unit must be protected from surprise by outposts and patrols. Reconnaissance is continuous. Points close at hand are patrolled by the front-line units. Other patrolling is ordered by higher commanders.

e. Withdrawal.—While the hostile attack is developing, strong combat patrols in front of the line of observation delay and harass the enemy. They ultimately retire to the defensive position. When a withdrawal is effected at night, the commander attempts to create the impression of heavily held lines by the use of combat patrols.

11. Strength and composition of patrols.—The situation, mission, terrain, distance the patrols must operate from friendly troops, and probable number of messengers required, determine the strength and composition of the patrol. The size of patrols

therefore will vary. Small patrols lightly armed and equipped will be used on reconnaissance missions where the information is obtained by stealth. However, when such patrols operate at a considerable distance from friendly troops and reports are to be sent back, they will require additional men as messengers. A patrol on a combat mission or where combat is probable must be strong.

12. Formations.—All patrol formations should provide for a point, flank protection, and a rear point ("get-away man"). It is the duty of the point and flankers to protect the patrol from surprise and to give timely warning of the enemy. If the point comes to an open space, it should maneuver under cover and reconnoiter before signaling the patrol to advance. Flankers should take care of woods or other points on the flanks in a similar way. The rear point man acting within his instructions protects the rear of the patrol against surprise.

a. In the open near the enemy.—The following methods should be adopted when crossing open spaces within view of the enemy:

(1) Pick the next stopping place before each advance.

(2) Move by rushes.

(3) One man moves at a time.

(4) All movements are made at a run.

(5) Each man remains motionless in observation after getting down.

b. Through woods.—To determine if woods are occupied, a few men should form a thin skirmish line covering the main body of the patrol which follows in file. Otherwise the patrol keeps together with proper provision for protection. In jungles, swamps, or canebrakes a patrol may be forced to use a trail. The formation should then be a column of files with a point and connecting file ahead, the men of the main part of the patrol close together, and a rear point.

c. In a ravine.—A ravine is traversed more safely by moving along the heights on one or both sides. If necessary to pass through a ravine or a cut, the patrol should be staggered, should keep close to the sides, and, when near the enemy, advance one man at a time.

d. To approach a skyline.—When it is necessary for a patrol to approach a skyline, one man should precede. He moves to a point on the crest where the skyline is broken. The other

members of the patrol should cover his advance from concealed positions.

e. To approach a house.—Houses generally are avoided by patrols. If it is necessary to approach a house the patrol should, from concealed positions, first watch for signs of the enemy. One man then should go forward by a covered means of approach. He should never go directly up to the door of the house but keep close to the wall as he approaches it. The other members of the patrol cover his advance from concealed positions, ready to open fire if necessary. (See fig. 24.)

f. Enclosures.—Enclosures generally are avoided by patrols. An enclosure should be approached and reconnoitered in the same manner as scouting a house. Men should be placed along the barriers to the enclosure in order to cover one man as he enters. (See fig. 24.)

g. To cross a stream.—The following steps should be taken by a patrol in crossing a stream: search is made for a bridge or ford. The other side is watched carefully for signs of the enemy. One man crosses while the others remain in concealed positions ready to protect him by fire. He reconnoiters and signals "Forward". The others cross one at a time, each taking up position upon arrival. Formation is resumed when all have crossed. (See fig. 24.) The following points should be noted about a stream:

- (1) *Bridge.*—Size, height, construction.
- (2) *Ford.*—Depth; rocky, muddy, or sandy bottom.
- (3) *Stream.*—Depth, width, current.
- (4) *Banks.*—Kind of slope, open or wooded; positions from which covering fire can be delivered.

h. To pass through a village.—When it is necessary to pass through a village, a patrol should follow one street, half of the patrol on each side of the street in single file. Each man should watch the buildings and windows on the opposite side of the street. Men should not go or be sent down side streets. The leading man should observe carefully along all cross streets from their junction. If enemy troops are known to be in the village, the advance should be made one man at a time with the rest of the patrol covering his advance. (See fig. 25.) The following points should be noted about the village:

- (1) Size and billeting capacity.

- (2) Construction of houses; whether of wood, brick, or stone.
- (3) Food and water supply.
- (4) Attitude of inhabitants.
- (5) Roads leading in and out.

i. Along ridge lines.—When a patrol must move parallel to a ridge, the flanker nearest it should observe over the crest frequently enough to prevent surprise.

j. Through a defile.—Men should be sent to each flank and the remainder of the patrol sent through the defile, one man at a time. Patrol formation is resumed as soon as the defile is passed.

k. Crossroads.—When a patrol approaches a crossroad, it should be halted and some of its men should be sent to the flanks so as to strike the side road on each side of the crossroads. They reconnoiter along the side road for a short distance away from the crossroad. The remainder of the patrol then moves up to the crossroad and is joined there by the flankers.

l. Halts.—(1) *Observation.*—A patrol halted in observation should place sentinels in covered positions to protect the front, flanks, and rear. (See fig. 26.)

(2) *Rests.*—A patrol should not stop for a prolonged rest. In case such a halt becomes necessary the patrol should stop at a place which offers opportunities for defense and from which a retreat can easily be made. The position should not be near any habitation. In the daytime it should be on high ground from which an extensive view may be had. At night it should be on low ground so as to bring persons approaching into view against the sky. Whether by night or day, all-around security must be provided.

13. Orders.—The commander, having in mind the purpose for which the patrol is to be used, determines and verifies its strength, selects its leader, designates a second-in-command, and gives his orders. As a rule, patrols are sent out for one definite purpose only. It is better to send out two patrols than to give one a double mission. Orders should be given to the patrol leader some time before he is to start. He must have ample time to familiarize himself with everything that will influence the actions of the patrol and to inform his men of

the mission, the situation to the front, the individual task of each man, the terrain to be crossed, and signals to be used.

14. Patrol leader.—*a. Qualifications.*—The character of the leader selected for a patrol depends upon the importance of the mission. For patrolling between strong points or along the lines of an outpost (visiting patrols), or for the simpler patrols sent out from a covering detachment, the average soldier is a competent leader. For a patrol sent out to gain information, or for a distant patrol sent out from a covering detachment, the leader must be specially selected. He must know the principles of patrolling, know how to dispose his command to the best advantage, and be able to examine large areas with few men. He must be able to estimate accurately the strength of hostile forces, to report intelligently as to their dispositions, to read indications, and to determine the importance of the information gained. He must possess endurance, courage, and good judgment.

b. Duties.—(1) *Preparatory.*—The patrol leader must understand his mission. He should then study a map and plan from it suitable routes, probable observing positions, and the formations he will likely use at various points on his route. He then should figure out different ways of accomplishing his mission and, by assuming that the enemy will act in a manner which would be most disadvantageous to the patrol, decide definitely on the plan which best promises success. He then plans his return in a similar manner.

(2) *Organization of the patrol.*—The leader decides on equipment for his patrol. He then assembles his patrol and inspects arms, ammunition, and the condition of his men. He takes away papers, maps, or letters that might be of value to the enemy. He discards equipment that will glisten in the sun or rattle during movement. He repeats his instructions to the patrol and assures himself that every man understands them and his part in the teamwork of the patrol. He explains the signals to be used and satisfies himself that they are understood.

(3) *Contact with the enemy.*—Reconnaissance patrols avoid fighting except to defend themselves, to prevent the enemy patrols from gaining valuable information, or to accomplish their mission. In such cases, a patrol fights resolutely, even though inferior in numbers.

(4) *Contact with civilians.*—Strangers should not be allowed to pass through or precede patrols. In questioning civilians, caution should be observed not to disclose information. Patrol leaders are authorized to seize telegrams and mail matter and to arrest individuals.

(5) *Value of information.*—Whether information gained while patrolling is of sufficient importance to be reported at once, or reported when the patrol returns, is a question which must be decided in each case. In case of doubt, it is generally better to send back the report. If the patrol leader has received proper instructions before starting and has the requisite ability as a leader, he can generally decide such questions as they arise. Trained patrol leaders and experienced scouts will bring back valuable additional information incidental to their missions.

(6) *Action when cut off.*—When a patrol is scattered, it reassembles at some point previously selected. If cut off, it returns by detour or forces its way through. As a last resort, the members of the patrol scatter so that at least one man may return with the information.

(7) *Reports.*—Upon his return from a patrol, the leader should make a full report to his commander. This is usually written. It should cover the following points:

- (a) Size of patrol.
- (b) Mission.
- (c) Time of departure.
- (d) Route.
- (e) Number of enemy seen.
- (f) Attitude of enemy (active, inactive, alert, or careless).
- (g) Condition of enemy auxiliary defenses (such as wire or trenches).
- (h) General character of ground traversed.
- (i) Route of return.
- (j) Time of return.
- (k) Condition of patrol (including casualties).

15. *By day.*—*a. Control and communication.*—(1) *Commands.*—Oral commands generally are used for control. This requires that members of a patrol ordinarily be within speaking distance of each other. If silence is necessary and the patrol small, communication between any two members can

be had only by one of them leaving his place in the formation and moving near to the other. If the patrol has an extra man he may be used to communicate with the point and flankers.

(2) *Signals.*—(a) Simple, prearranged signals may be used for communication and control. Such signals must be known and understood by each member of the patrol.

(b) Members of a patrol should be familiar with the infantry arm signals for the execution of the following: *Forward; By the right (left) flank; To the rear; Halt; Lie down (or Take cover); Double time (or Rush); Change direction; Assemble; As skirmishers; Are you ready (or I am ready); Enemy in sight.*

(c) Each member of the patrol should be familiar with the patrol formation so that if he wishes to give a signal he will know the position of the man to whom he wishes to send it.

(d) The patrol leader should instruct all men that, whenever they are away from the center of the patrol, they must look frequently to the nearest man for signals.

b. *Equipment.*—(1) The usual items of equipment for members of a patrol operating in the daytime are rifle or pistol, haversack with rations, canteen, map, compass, watch, pencil and paper, field message book, field glass, and a cloth cover for the helmet.

(2) White uniforms, snowshoes, and skis may be used in snow.

(3) For patrols operating in canebrakes, woods, jungles, and swamps, the bolo will be useful.

(4) The mission and probable action of a patrol will determine its equipment.

c. *Movement.*—(1) *Conduct of advance.*—A patrol usually advances by bounds from one covered position or point of observation to another. The length of the bounds and the manner of proceeding depend upon the proximity of the enemy, the nature of the terrain, and the urgency of the mission. When it is known that the enemy is distant, bounds may be long and little attention paid to concealment. As the patrol nears areas under hostile observation, the advance must become more cautious and distance between points of observation shortened. In approaching dangerous areas the patrol leader sends one man forward to the next position while the others

cover his advance. Once in position, the man signals "Forward," if all is clear, and remains in observation while the remainder of the patrol comes up.

(2) *Cautions.*—(a) Flankers must not lose contact.

(b) When a patrol approaches a point from which the enemy may have observed its advance, it should maneuver to approach from a flank.

d. Patrol leading.—(1) Normally the patrol leader should be in or near the center of his patrol but he moves about to wherever his presence and example are most needed, whether in reconnaissance or combat.

(2) The patrol leader governs the rate of advance.

(3) The leader must make decisions, then tell each member of the patrol what he must do to carry them out.

16. By night.—*a. Necessity.*—When contact has been gained with the enemy, daylight patrolling becomes difficult, if not impossible. Yet reconnaissance of the enemy must be continuous. In the daytime, it is done from observation posts; at night, chiefly by patrols.

b. Arms and equipment.—(1) The arms, equipment, and clothing of patrol members will vary with the seasons, light, weather, geographical location, mission, and character of operations. At night the helmet and bayonet scabbard usually are discarded. The following articles of equipment may be added: riot gun, trench knife, clubs, blackjack, brass knuckles, sweater, knitted cap.

(2) Night work in mobile situations may cause a scout to be separated from his command for such long periods that it may be necessary for him to carry rations, water, and extra ammunition.

(3) In stabilized situations the scout is usually separated from his command for only a few hours; therefore rations and extra clothing may be dispensed with.

(4) The nature of the mission will determine the type of weapon to be carried.

(5) The blade of the bayonet should be darkened or painted olive drab.

(6) Luminous compasses or watches should not be carried in a manner which exposes the luminous dial.

(7) Clothing should be warm, comfortable, blend with the background, and should permit noiseless movement.

(8) Woolen articles are preferable to cotton, waterproof, or leather garments. Wool tears with less noise and permits more silent movement through grass, weeds, or rocky terrain.

(9) The use of gloves should be left to the choice of the individual.

(10) Shoes should be oiled to prevent squeaking. Leather leggings, boots, and rubber boots should never be worn.

(11) Flashlights should never be carried except when enemy dugouts must be searched.

c. Control and communication signals.—(1) *Control.*—(a) A patrol can be controlled during the day by hand signals or by word of mouth. At night, hand signals cannot be seen and talking or whispering betrays the patrol to the enemy. Control signals should be similar to common night sounds and as little like human sounds as possible. The following might be used: the scraping together of two sticks or stones, the rustling of a piece of paper, imitations of birds, animals, or insects. Whatever its nature, the signal should be only loud enough for all members of the patrol to hear.

(b) By the control signal the members of a patrol can be stopped, started, or checked to see whether any members are missing; for example, by signaling once to halt, twice to go forward, and a drawn-out signal to check up. The code should be changed for successive patrols.

(c) Signals to stop and to move forward usually are given by the point, but in emergency they may be given by any member of the patrol. Whoever halts the patrol must start it again. The check-up signal should start with the leader and be answered according to a prearranged plan by the point, flankers, and rear point. In order to detect enemy interference, the signal should be answered after a prearranged interval, such as a count of four.

(2) *Emergency.*—(a) If the point, flanker, or rear point is attacked by the enemy, a word or phrase such as "Front," "Right," or "Rear" will indicate the direction of the danger.

(b) During hand-to-hand struggles a prearranged word, number, or phrase used as a recognition signal will serve to distinguish friend from enemy.

(3) *Direction.*—Sometimes rockets may be sent up at specified intervals from a point behind the lines to enable the patrol to keep its proper direction.

(4) *Means of making sound signals.*—The following means of making sound signals are suggested:

(a) Rubbing the teeth of a comb across a wooden surface, such as a rifle butt or a wooden pistol grip.

(b) Rubbing a pencil or piece of dry wood across the teeth.

(c) Rubbing the palms of the hands together.

(d) Rubbing the edge of the thumb nail across a button of the service coat.

(e) Snapping the edge of a match box with the fingernail.

(f) Blowing softly across the edge of an empty cartridge case.

(g) Blowing through an ordinary pipe stem separated from the bowl.

(h) Blowing against the edge of a piece of cardboard.

(i) Rubbing the palm along the breeches leg or arm of the blouse.

d. *Formations.*—(1) *General.*—(a) Though the formation of a patrol will vary according to circumstances, it should always be such as to furnish protection and to enable rapid action in any direction.

(b) Every formation must have a rear point, flankers, and a point. The patrol should be spread out to the limits of control, because a group of men closed up may easily be surrounded, rushed, or disabled by a burst of fire or the explosion of a shell or hand grenade.

(2) *Action when attacked.*—Should the patrol be attacked, the scout who first perceives the danger or the man attacked calls out the danger signal, or the man attacked calls out "Front," "Right," "Left," or "Rear," thus indicating the point of danger or the man attacked. All members of the patrol face toward the man attacked. The men then on the flanks of the man attacked rush straight ahead and close in on the enemy from the flanks. The patrol leader and the men with him rush the enemy in extended order, closing in as necessary. During the combat, all members of the patrol repeat their recognition signals. The man farthest from the point of danger becomes the rear point

and does not enter the fight. An illustration of this method in event of the right flank man being attacked is as follows:

(a) He calls out, "Right."

(b) All members of the patrol face toward the right. The point and rear point, now on the flanks, rush straight ahead and close in on the enemy from the flanks.

(c) The patrol leader and the men with him rush the enemy in extended order, closing in as necessary.

(d) During the combat, all members of the patrol repeat their recognition signals.

(e) The left flank man, farthest from the danger, becomes the rear point and does not enter the fight.

e. Movements.—In selecting routes, preserving silence, and acting under a flare, the individual members of a patrol should be guided by the same principles that are laid down for the individual scout at night.

(1) *The start.*—The officer sending out a patrol determines the hour when and the point where it will leave the lines; also the route, and the probable hour and place of return.

(2) *Rules of conduct.*—(a) The outpost machine-gun officer, howitzer commander, and artillery liaison officer should be notified of the time of departure, route, and probable time of return of all patrols sent out.

(b) A list of the names of all men taken out on the patrol should be left behind so that the patrol may promptly be checked if it suffers casualties or becomes scattered.

(c) Before starting, each member of the patrol should understand the plans thoroughly so that explanations will be unnecessary after the outguards are passed.

(d) Wounded or dead should never be abandoned. The apparently dead man may be only unconscious.

(e) Hot food should be served to the patrol on its return.

(f) In open warfare the patrol should be formed behind the line of outguards and moved through them at the designated point. At the line of outguards the leader should halt his patrol and ask the outguard commander for any information of value to the patrol. He then proceeds on his mission.

(g) During stabilized situations the patrol leader should leave the trench first, followed in single file by the members of his patrol at distances of 5 yards. They should pass through

their wire, crouching low. The patrol leader should halt at the end of the gap and listen for enemy patrols in the neighborhood. He should then form his patrol, sending out the point and flankers first. They halt at the proper distance and kneel. When all are in position the leader starts the patrol by signaling "Forward." Frequent halts are made for listening.

(3) *Ambushes.*—Positions from which a hostile patrol is to be ambushed should be such that the hostile patrol may be seen when coming over the skyline.

(4) *To approach enemy line.*—If there is no obstacle in front of the enemy outguards the patrol should approach the line of outguards cautiously and attempt to work between two groups. The rate of advance and caution exercised will depend upon the distance to the nearest hostile group. If this distance is less than 50 yards, the patrol can move only by crawling. During the advance, all members of the patrol must be constantly alert to discover and avoid hostile patrols.

(5) *To investigate own wire.*—A patrol investigating its own wire should work outside the wire with protection toward the enemy, in front, and to the rear. Two men should move along the parapet of the trench; one to drive stakes in the parapet opposite any gaps discovered, the other to precede the patrol and to warn sentries whom it is to pass. The patrol leader should go through all gaps and make notes of the character of each. (See fig. 27.)

(6) *To investigate enemy wire.*—Two men of the patrol go through each gap discovered and note its character. The others remain outside to protect the front, flank, and rear. Gaps discovered are oriented by compass bearing on one or more prominent features behind our line. (See fig. 27.)

(7) *To determine position of enemy outguards.*—(a) *Value.*—During periods of stabilization it is possible by systematic reconnaissance to find every enemy outguard. This knowledge prevents raids on unoccupied places; it facilitates the capturing of prisoners; and it assists in laying harassing fires on enemy groups.

(b) *Method.*—Several patrols are sent out at the same time from designated points along the line. Each patrol follows a given compass direction to a point about 50 yards outside the enemy wire, remains there, and listens for sounds of enemy

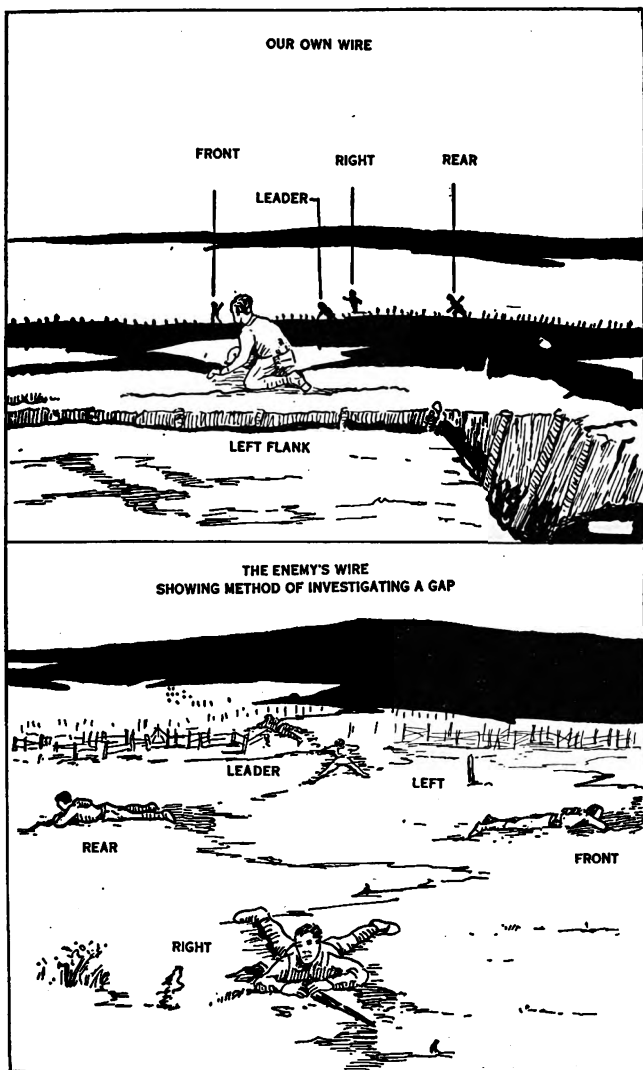


FIGURE 27.—Formation used by patrols inspecting wire at night.

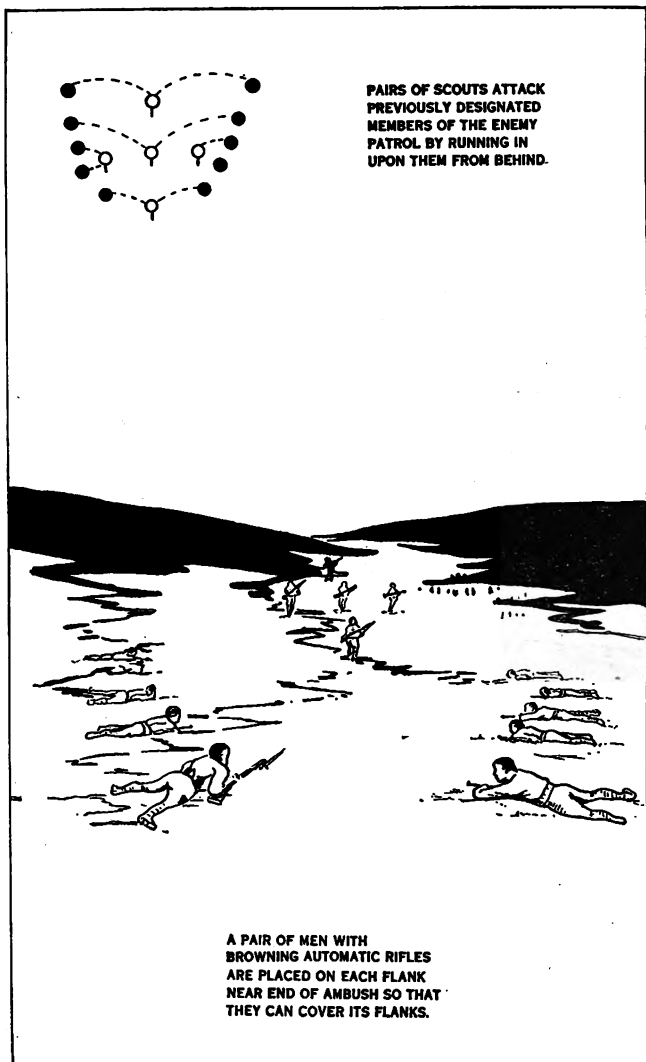


FIGURE 28.—A night ambush.

occupation, such as talking, coughing, challenging, or firing. Each patrol leader takes the compass direction to each sound heard and estimates the distance to it. The position of each sound can then be plotted on the map by laying off the direction and estimated distance from the spot the patrol occupied while listening. (See fig. 18.)

(8) *To capture an enemy patrol.*—When an enemy patrol has developed fixed habits with regard to route, size, and formation, it may be ambushed if the rules given below are followed (fig. 28) :

- (a) Take out more men than the enemy will have.
- (b) Inform each man of the individual enemy he is to attack.
- (c) Go out early into position on the enemy route, in a reverse formation to that of the enemy.
- (d) Provide automatic riflemen to cover the withdrawal.
- (e) Attack simultaneously on a prearranged signal.
- (f) Attack each man from the rear if possible.
- (g) Insure accuracy in use and understanding of the identification signal.
- (h) Use bayonets, knives, and blackjacks.

SECTION IV

MISCELLANEOUS

17. Observation posts.—*a. Establishment.*—When the enemy is encountered and his position is in sight, observation posts should immediately be established. Although such posts do not take the place of patrols in the early stages of an engagement, they greatly assist in determining hostile dispositions, the number and positions of the supporting weapons, and the extent of hostile activity. As the two forces remain facing each other, daylight patrolling becomes difficult, and reconnaissance must be carried out from commanding points behind the line of outguards. These observation posts should be placed so as to cover the entire front and all ground within the position itself.

b. Operation.—An observation post is manned by two scouts, an observer and a recorder, who change duties every 15 or 20 minutes and are relieved at the end of 2 hours. One man observes with field glasses. When he sees any sign of enemy

activity he takes a compass reading on it, estimates its distance, and gives this information to the other scout who records it, together with the time. During the early stages of an engagement, several messengers should be assigned to each post. If the situation becomes stabilized, all information gained may be turned in at the end of the tour of duty and messengers will not be needed.

c. To observe.—(1) An alternate position should be available for immediate occupation.

(2) Trees should be used only temporarily. The best location for an observation post is on high ground. It should be dug in but the appearance of the ground must not be greatly altered.

(3) Different routes should be used for entrance and departure.

(4) Observers should always act as though they were being watched.

(5) Unless attacked, no weapon of any sort should be discharged from an observation post.

(6) All movement should be avoided when enemy airplanes are overhead.

(7) Every incident, no matter how trivial, should be reported. The commanding officer should be informed also of any unusual occurrences among his own troops.

(8) Battalion and smaller unit posts depend upon runners for communication. Regimental and higher unit posts should have telephones. All telephone conversations should be in code.

(9) Observation posts should be equipped with signal pistols and other equipment which will enable them to report immediately any sudden or important enemy movement.

(10) All newly discovered activities of the enemy should be pointed out to the relieving personnel.

(11) All equipment of observation posts, especially maps, should be ready for immediate destruction.

18. Raids to secure identifications.—*a. Purpose.*—Identification of hostile units is accomplished by capturing prisoners from the enemy units in contact with our troops. Raids upon hostile outguards or advanced detachments are made for this purpose.

b. Preliminary arrangements.—(1) The position of the enemy outguards should be accurately determined.

(2) Hours of enemy relief should be learned.

(3) Size of enemy outguards should be known.

(4) A gap should be found, or cut, in the enemy wire near the outguard to be captured.

(5) White tape may be laid on the ground to guide raiding parties to the proper gap in the enemy wire.

c. Procedure.—(1) The party should move directly to the gap in the enemy wire, halt, and take up its position. The following combat elements should be provided:

(a) Automatic riflemen on each flank and in rear, to cover the withdrawal.

(b) A squad of riflemen in a semicircle at the entrance to the gap.

(c) Two men well supplied with hand grenades at the inside end of the gap to cover the withdrawal if the raiding group is pursued.

(2) The scouts should pass in through the gap, cross the trench to one side of the enemy post, and approach it from the rear.

(3) The enemy post should be attacked at a prearranged signal. If the surprise is complete, no firing or scuffling should be necessary; knives, blackjacks, or pistols (used as clubs) should quickly dispose of those who resist.

(4) The prisoners should be taken out of the trench quietly and quickly and wounded or dead raiders brought along.

(5) The grenade men at the gap should guide the raiders by repeating a prearranged signal.

(6) Led by the riflemen and covered by the grenade men and the automatic riflemen who follow as soon as the party has cleared their positions, the raiding scouts, accompanied by prisoners, should return rapidly to their own positions.

(7) If the enemy is plentifully supplied with flares, smoke candles are useful on a raid. The candles should be lighted as soon as the enemy is attacked so the smoke screen will prevent the enemy from picking off members of the patrol. A light wind blowing toward or away from the enemy position is most favorable for using smoke.

19. Sniping.—When not engaged in scouting duties, scouts may be used to inflict casualties on the enemy by picking off leaders and harassing bodies of troops or individuals who expose themselves.

a. Positions.—The following considerations should be given the selection or construction of snipers' posts:

(1) The post must have a field of fire over the designated sector.

(2) It must offer concealment to the men in it. It must not be silhouetted against the sky or a contrasting background. If a tree is used, a dark background is of the first importance.

(3) The approach must be covered and the making of paths avoided.

b. Operation.—A sniping post is a fixed fighting patrol of two men. It is equipped with field glass (or telescope) and a rifle, preferably with telescopic sight, for each man. One scout acts as observer, the other as sniper. They change duties every 15 or 20 minutes. The observer searches his sector for a target. As he finds one, he describes and locates it and the sniper fires at it. The observer notes the result of the shot. Upon being relieved, the men of each post submit a report of activities during their tour of duty similar to those submitted by observers.





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